APRIL, 1951

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

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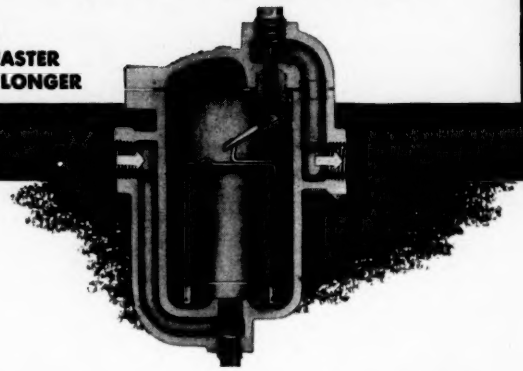
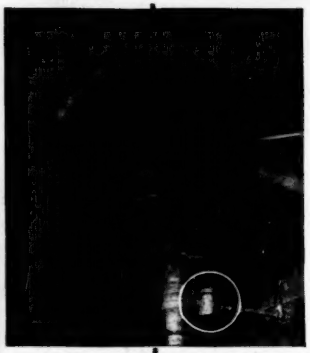
Here's the Trouble-Saving Trap for Low Pressure Vacuum Return Heating

IT GIVES YOU MORE HEAT, FASTER —AND LASTS LONGER





"50% REDUCTION IN STEAM TRAP MAINTENANCE since installing Armstrongs on 5 psi system with vacuum return."—*John Deere Ottumwa Works, Ottumwa, Iowa,*

"HEAT-UP TIME CUT 10%. Only $15.00 annual maintenance on 300 traps on low pressure vacuum return heating system." —*John Deere Harvester Works, East Moline, Illinois.*

ARMSTRONG inverted bucket steam traps are real *trouble-savers* on low pressure heating systems for these quickly understandable reasons:

1. No Trouble Holding Vacuum — you can't hold return line vacuum with leaky steam traps. Armstrong's *stay* steam-tight — often go for years without repairs. You get a big bonus in steam and fuel savings, too.

2. No Trouble with Corrosion — air and CO_2, particularly in unit heater coils, cause serious corrosion. Every time an Armstrong trap opens there is a momentary pressure drop that "pumps" air down to the trap where it is discharged along with condensate.

3. No Trouble Getting Fast Heat-up — Armstrong traps quickly draw off air that retards heat-up. Where large amounts of air are encountered when steam is turned on, traps with big thermically-operated bucket vents are available with capacity to handle 500 to 1500 cu. ft. of free air per hour.

4. No Trouble Keeping Heating Units HOT — Armstrong traps discharge condensate *at steam temperature* as fast as it accumulates. This keeps heaters packed with hot, dry steam for top BTU output.

5. No Trouble with the Traps — There is nothing to stick, clog, leak or collapse in an Armstrong trap. The hardened chrome steel valves and seats in traps for heating service are identical in design, workmanship and materials to those in Armstrong traps for service at 1500 psig, 900°F. Interior trim is corrosion-resistant 18-8 stainless. No wonder they last so long with so little attention!

Armstrong traps are guaranteed to give you satisfaction or your money will be refunded. They are guaranteed against defects *forever.* Call your local Armstrong Representative for the traps you need now. ARMSTRONG MACHINE WORKS, 846 Maple Street, Three Rivers, Michigan.

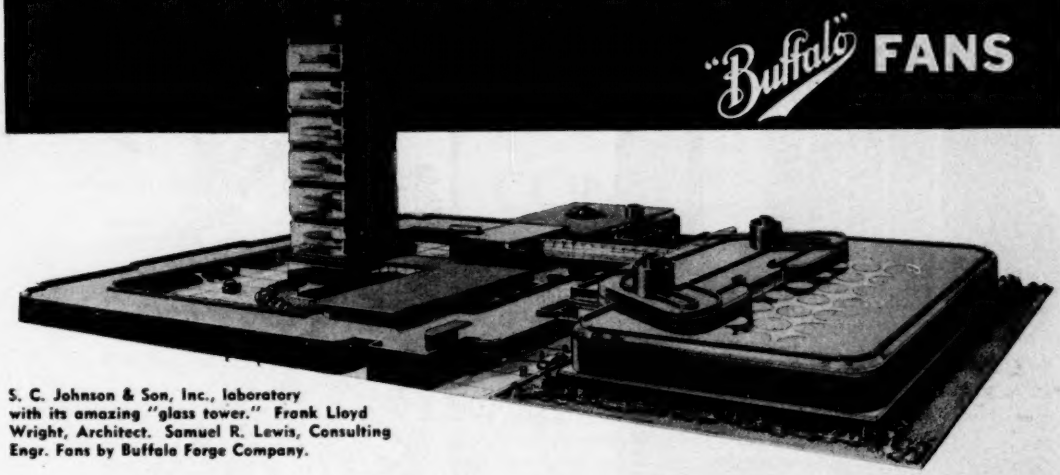
SEE OUR CATALOG IN SWEET'S

SEND FOR THE 36-PAGE STEAM TRAP BOOK FOR COMPLETE DATA

ARMSTRONG STEAM TRAPS

JOHNSON'S WAX RESEARCH TOWER

"Buffalo" FANS

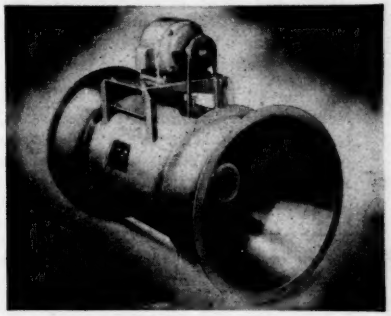


S. C. Johnson & Son, Inc., laboratory with its amazing "glass tower." Frank Lloyd Wright, Architect. Samuel R. Lewis, Consulting Engr. Fans by Buffalo Forge Company.

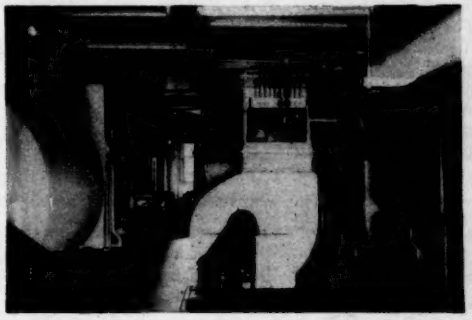
15 stories with glass and brick walls, the entire structure suspended by means of a concrete "core" running down through the center—the Johnson Wax Research Tower is one of the structural marvels of mid-century! Designed in behalf of the American Housewife, the tower enjoys conditioned, dust-free air at all times. "Buffalo" fans supply the air.

"Buffalo" Fans are putting air to good use in every type of plant—improving product and process control —promoting health and safety—stepping up worker productiveness — increasing profits. And they are doing it efficiently.

Write us about your job for air. There's a "Buffalo" Fan or Air Conditioning unit to handle it to your satisfaction!



● "Buffalo" Axial Flow Fans are popular both for light-duty ventilation and air conditioning work.



● "Buffalo" LL Fans are widely used to supply air for air conditioning units, like these insulated fans.

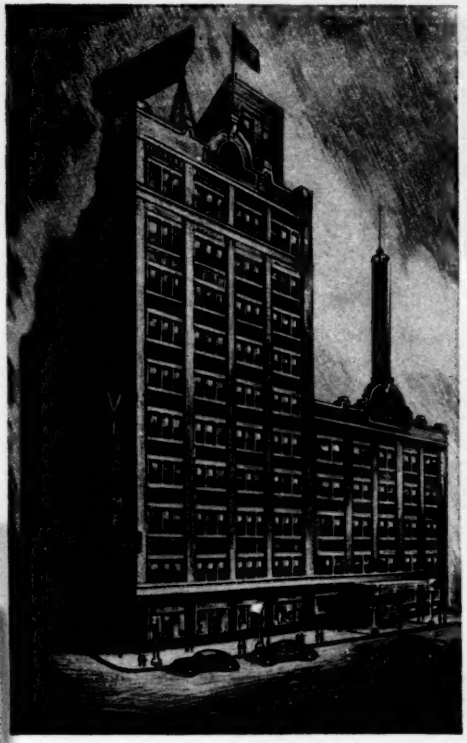
FIRST FOR FANS

BUFFALO "Buffalo" FORGE COMPANY

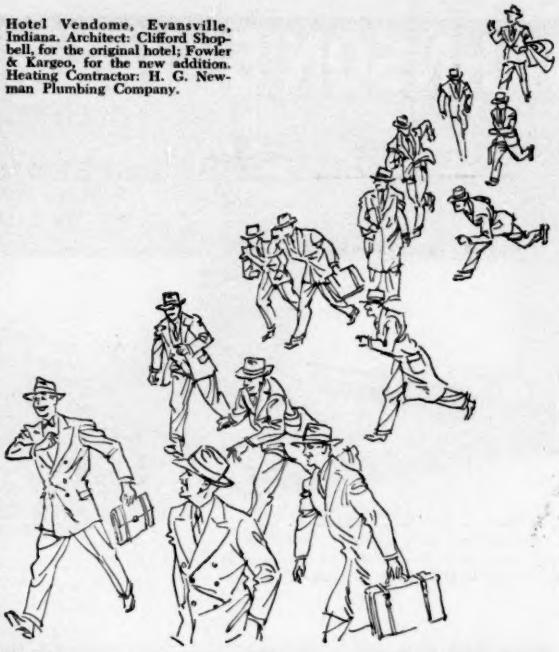
480 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING



Hotel Vendome, Evansville, Indiana. Architect: Clifford Shopbell, for the original hotel; Fowler & Kargeo, for the new addition. Heating Contractor: H. G. Newman Plumbing Company.



44 years young

A story of sound heating system operation

In 1907, when the population of Evansville, Indiana, was 69,000, a modest 5-story hotel was built.

"Give us a heating system that will stand the test of time", the owners of the new Hotel Vendome told the H. G. Newman Plumbing Co., of Evansville. And so it was that the complete mechanical plant — from the high-pressure boilers to the Webster Vacuum Steam Heating System —was planned for long service life.

Five floors were added to the Hotel in 1913 . . . a 5-story annex was built in 1927—and both times there was an extension of the Webster Heating System.

In 1950, when Evansville had grown to 130,000, the Hotel Vendome undertook a complete renovation, including modernization of their mechanical plant. Once again they called on the H. G. Newman Plumbing Company. And once again they selected Webster Steam Heating Equipment.

Webster Radiator Traps and Valves, Drip Traps and other steam specialties are smaller, more compact than they were in 1907. Their efficiency and long service life have been even further improved.

Charles J. Scholz, president, Hotel Vendome, Inc., and his sons, Norman F., and Frederick J., vice-presidents, are convinced that modern heating pays for itself—in satisfied guests and lower operating costs.

For the last 42 years, Webster Service to the Hotel Vendome, their architects and contractors, has been provided by the organization of S. E. Fenstermaker, Indianapolis, one of the Webster family of long-service Representatives . . . the kind of service that is more important than ever today.

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Webster HEATING

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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The Contents of HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and by Engineering Index

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Also Publishers of
HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

Theaters are the amusement centers in many municipalities and communities. Large crowds are frequently attracted, as can be seen by the illustration which shows persons in a motion picture theater lobby waiting to be seated. For details on the design of suitable air conditioning systems for theaters, see page 81.

reasons why

FOR THE MAN WHO HAS TO

install

In designing AAF products, details of installation are given the same careful consideration as performance and maintenance. Simplified installation is an important factor today which means dollar savings in time and labor to the contractor.

Typical examples of attention to installation requirements are the AAF unit filter frame and the Herman Nelson DRAFT | STOP units.

AAF

American Air Filter

COMPANY INC.,

HERMAN NELSON DIVISION

herman nelson

PLANTS: LOUISVILLE, KENTUCKY MOLINE, ILLINOIS

AMERICAN **HV-2** FILTER

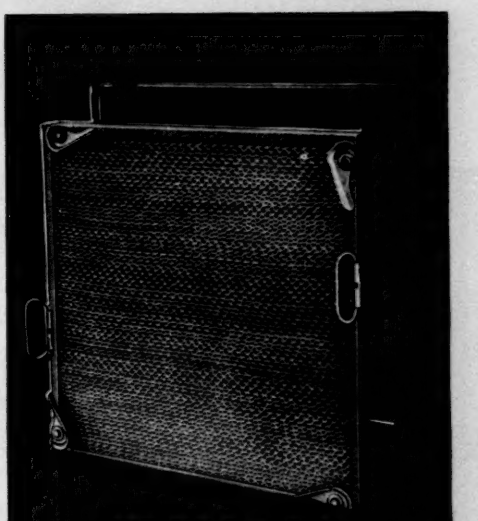
Here is an example of AAF engineering for economy in installation.

This filter is furnished in three designs to meet various application requirements. Two of these designs are for use as frame units and one without handles or latches where supporting members are provided.

The frames are easily assembled with standard #7 rivets and may be installed in straight bank or V-arrangement.

This same careful attention to easy installation has been applied to AAF's entire line of air filters, from electronic precipitators to the inexpensive AMER-*glas* disposable filter.

When you compare prices, don't overlook the cost of installation.

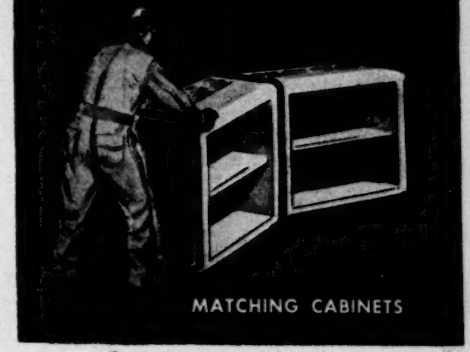


AMERICAN Type HV-2
Air Filter

HERMAN NELSON DRAFT | STOP SYSTEM

DRAFT | STOP is a system entirely different from conventional classroom ventilation methods. Because it keeps classrooms free of drafts by trapping them near the source, it might be assumed that the DRAFT | STOP System presents a complicated installation problem. Since it does so well what other ventilation systems have always tried to do, you might expect installation to involve difficult engineering problems. Not so! No additional piping, traps or valves are required with DRAFT | STOP. The DRAFT | STOP System can be installed simply by (1) Standard piping of the proper size Herman Nelson Unit Ventilator; (2) Arrangement of a suitable combination of utility cabinets; (3) Locating and installing in the wall, when required, the Ventimatic exhaust outlets.

Your DRAFT | STOP System can be a wall-to-wall installation, but it need not be. Flexibility is another benefit of Herman Nelson designs. It makes for rapid installation with fewer piping problems, another benefit when DRAFT | STOP is specified.



MATCHING CABINETS

Some of the Many Installations of

POWERS

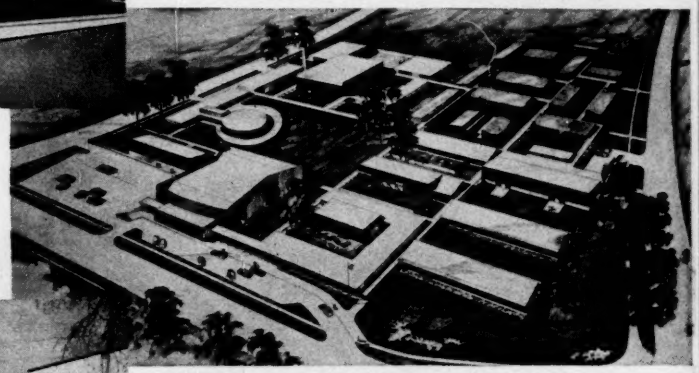
Pneumatic Temperature Control

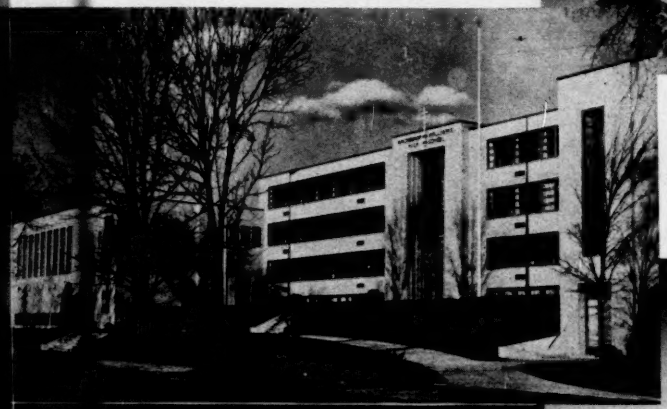
In Contemporary Secondary Schools

Assures Utmost Comfort and Efficiency of Teachers and Pupils
Lower Maintenance—Bigger Fuel Savings
Many 25 to 40 year old installations still giving dependable regulation
. . . . . these and many other plus values in POWERS systems of temperature control give users more for their money

Above: Junior High School 54, Manhattan, New York City.
Architect: Eric Kebbon. Engineer: T. F. Dwyer, Board of Education, City of New York.
Heating Contractor: Daniel J. Rice, Inc., Long Island City, N. Y.

Below: Archbishop Williams High School, Braintree, Mass.
Architects: Maginnis and Walsh, Boston, Mass.
Engineer: A. Ehrenzeller, Boston, Mass.
Heating Contractor: Fred. Williams, Inc., Boston, Mass.





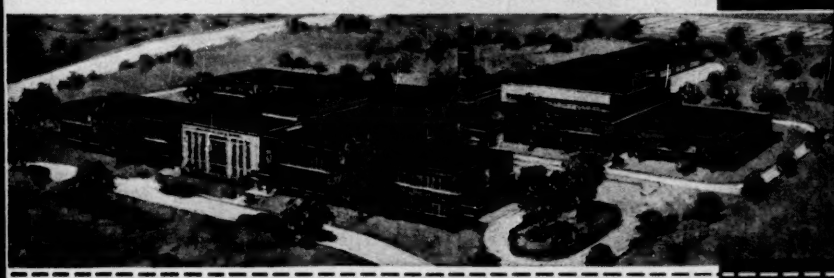
Above: Westchester Junior High School, Los Angeles, Cal.
Architects: Sumner Spaulding and John Rex.
Mechanical Engineers: Bartlett & Berky.
Heating Contractor: West Coast Plumbing & Heating Co.

Below: Intermediate and Farragut Ave. Schools, Culver City, Cal.
Architects: Daniel, Mann and Johnson, Los Angeles, Cal.
Consulting Engineer: Chester D. Walz
Heating Contractor: S. Glen Hickman Co.

POWERS

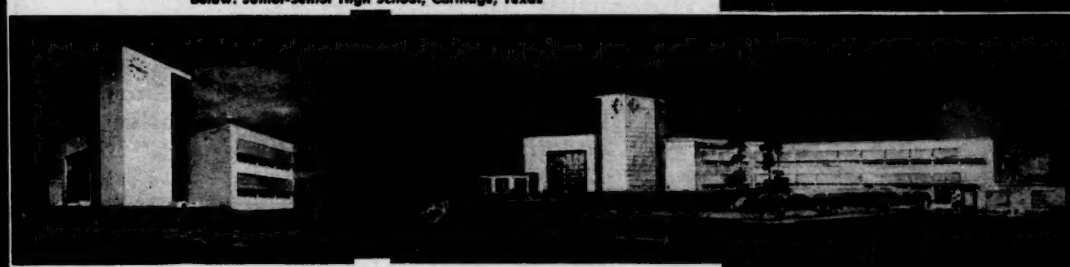
POWERS

POWERS



POWERS

Below: Junior-Senior High School, Carthage, Texas



Architect & Engineer: Preston M. Geren, Fort Worth, Texas.
Heating Contractor: Spencer Plumbing & Heating Co., Dallas, Texas.

POWERS

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THIS FREE SERVICE CAN HELP SLASH YOUR FUEL OPERATING COSTS

Anthracite Institute offers building management and management engineers and property owners this free complete heating survey regardless of the kind of fuel used.

Without cost or obligation an experienced, accredited combustion engineer will be glad to make an inspection of your heating plant. As part of the survey, he will provide you with an engineering analysis which covers the size and type of fuel which your plant should or could burn for maximum efficiency. He will check present controls; he will survey the over-all condition of the boiler and check firing methods. He will check air elimination and combustion efficiency by flue gas analysis.

Following this comprehensive engineering analysis, he will submit a detailed report to you or your agent. Included with the report will be the benefit of his personal counsel if it is wanted. **There will be no charge for any part of this service.**

Smoke Control

Smoke is an indication of wasted fuel. If you have trouble with smoke, this analysis will be of particular value because as part of this over-all survey, we will study your smoke problem. The analysis and following report will show you the quickest and most economical way to reduce your fuel bill. All methods will be studied including the advisability of changes in present firing methods, the installation of mechanical firing and possible changes in size or mixtures of fuels.

Here's a typical testimonial from one satisfied user on the value of this service

"We wish to thank you for the 8 reports which you sent us covering the maintenance and operation of the steam plants in those buildings. We intend to carry out most of your recommendations and are confident that it will help us to reduce the fuel costs in these buildings. Several of the recommendations are items which had never been called to our attention before and will be helpful . . . in improving the efficiency of the plants in other buildings which you did not inspect."

• • •

This engineering analysis of your heating system is available to you without cost or obligation. To obtain it just phone MUrray Hill 9-6890 or write today to Anthracite Institute, 101 Park Avenue, New York 17, New York.

ANTHRACITE INSTITUTE

101 Park Avenue • New York 17, N. Y.

FOR EVEN TEMPERATURES

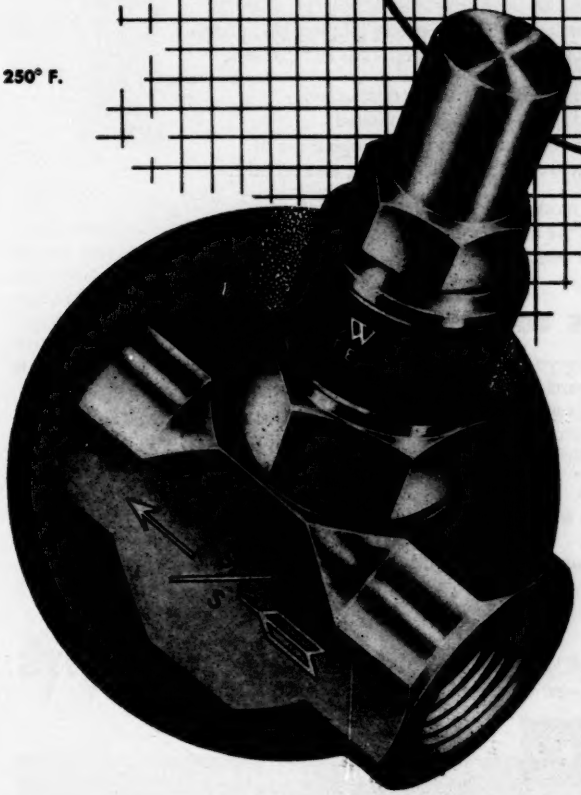
400° F.

350° F.

300° F.

250° F.

YARWAY STEAM TRAPS



● Processes requiring careful temperature control call for Yarway Impulse Steam Traps on steam equipment.

The reason! . . . Yarway traps maintain even temperatures because they *continually* sample and respond to a trickle of the condensate. There is no arrest in flow, no waiting for large quantities of condensate to accumulate, or trapped steam pockets to condense.

Other reasons why Yarway Impulse Traps have become first choice in many thousands of plants:

- **They get equipment hotter, sooner**
- **Small size, light weight**
- **Easy to install, easy to maintain**
- **Only one moving part**
- **Good for all pressures**
- **Stainless steel construction**
- **Low cost**

If you are not already familiar with these and other advantages of the Yarway Impulse Steam Trap, try one *for free* and find out for yourself. Call your nearby Yarway distributor, or write to:

YARNALL-WARING COMPANY

104 Mermaid Avenue • Philadelphia 18, Pa.

BRANCH OFFICES IN PRINCIPAL CITIES

Stainless Steel Body

YARWAY IMPULSE STEAM TRAP

NOW PRECIPITRON...

THE ELECTRONIC AIR CLEANER

IS AVAILABLE AS A COMPLETE "PACKAGE"

Saves You **MATERIAL PROCUREMENT • ENGINEERING EXPENSE INSTALLATION EXPENSE • TIME AND MANPOWER**

Westinghouse PRECIPITRON, the electronic air cleaner, has long been used where clean air is a *must*. Its wide acceptance is due to three factors: 1) its design—*invented* by Westinghouse and developed through years of engineering and application experience; 2) its efficiency—*three times* more efficient than the *best* mechanical air cleaner; 3) its dependability—proved by countless installations.

In industrial plants and commercial buildings, soilage, contamination, or rejects caused by airborne dirt and foreign matter is eliminated by PRECIPITRON. Circulating air for individual rooms or for large areas of plants and office buildings can be made free of dust, dirt, pollen, and oil mist.

NOW, Westinghouse announces a new model which incorporates all the features of the standard line, and adds the convenience and money-saving advantages of a factory-designed, factory-matched *encased* unit.

HERE'S WHAT IT MEANS TO YOU:

Material Procurement Reduced. Everything you need is provided . . . no searching for scarce parts or supplies, or resorting to substitutes . . . 18-gauge casing and 10-gauge tank of galvanized steel assure rigidity; entering side baffles provide proper air distribution.

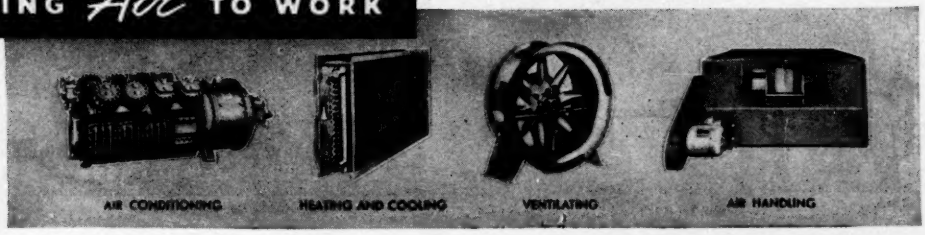
Eliminates Layout and Enclosure Design. Complete unit available in capacities from 8,000 to 44,000 cfm comes ready for assembly at the site . . . flanges punched for duct connections . . . sealed access doors with safety interlocks are pre-installed . . . all parts fit . . . even the hardware is included!

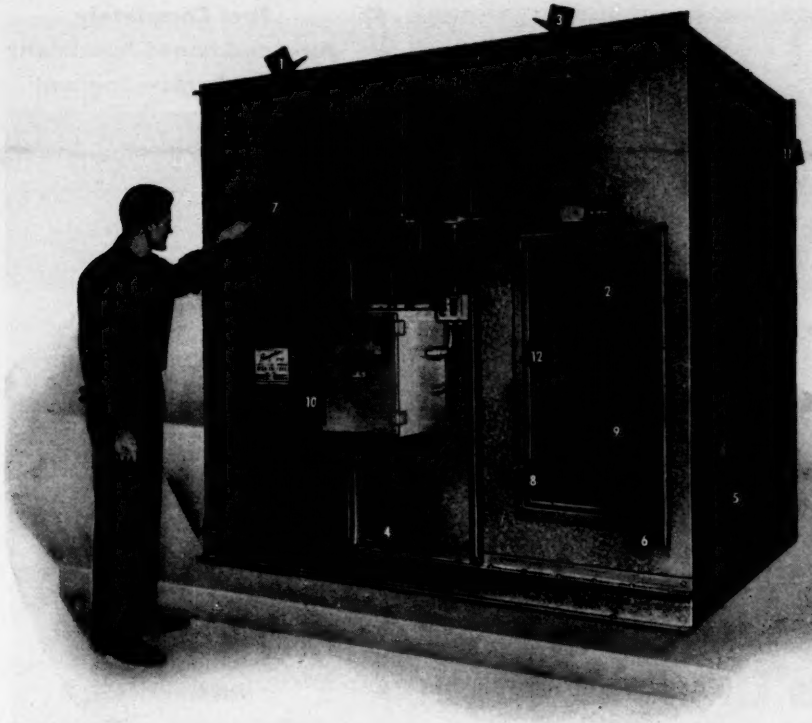
Masonry Work Reduced or Eliminated. Drain tank for flushing away collected dirt lays into place and unit bolts to it . . . range of 24 sizes from 8' x 5' x 5' to 8' x 10' x 11' permits matching to the job.

Saves Time and Manpower. Prefabricated parts, factory-matched, save assembly time and assure proper installation . . . highly skilled labor not required.

YOU CAN BE SURE...IF IT'S

PUTTING *Air* TO WORK





New Encased Precipitron Electronic Air Cleaner

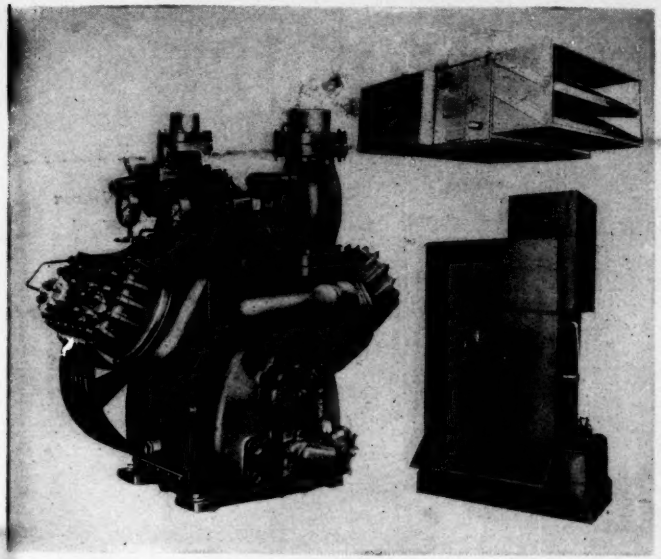
Read about these and many other benefits such as accessibility, ease of maintenance, and undivided responsibility. Ask for application data DB 93-820 TODAY, and see for yourself how the PRECIPITRON Encased Unit can save you money. Westinghouse Electric Corp., Sturtevant Division, 131 Damon Street, Hyde Park, Boston 36, Massachusetts.

Write for booklet DB 93-820 today!

Westinghouse

CONSTRUCTION FEATURES

1. Furnished complete and ready for assembly . . . top, sides, and base with drain pan, prefabricated and factory matched.
2. 90% or 85% Blackness Test Efficiency.
3. 24 sizes, capacities from 8,000 to 44,000 cfm . . . standardized construction—8' length in direction of air flow; nominal heights, 5' to 10'; nominal widths, 5' to 11'.
4. 18 ga casing and 10 ga tank of galvanized steel and welded construction—hardware included.
5. Punched inlet and outlet duct flanges.
6. Right or left side access doors—sealed to eliminate leakage.
7. Door interlock switches for operator safety.
8. No moving parts—low maintenance.
9. Aluminum cell construction—corrosion resistant, easy to service.
10. Self-regulating power pack—low power consumption.
11. Entering-side baffles for proper air distribution—leaving-side filter frames optional.
12. Complete accessibility for inspection, washing, maintenance.



Who Makes a COMPLETE Freon Reciprocating System?

A completely integrated and balanced system—all *manufactured*, not just assembled, by the *one* manufacturer—that's Worthington.

No other company makes a wider variety of complete Freon reciprocating systems.

No other company offers more perfectly balanced operation of inter-related components—for lowest costs, longest life.

Worthington Freon-12 Compressors and Refrigeration Units. One basic compressor design covers a size range from 2 to 125 tons, with three cylinder sizes. Simplified construction. Lightweight automotive pistons. Worthington Feather* Valves—simplest, lightest, quietest ever made. Internal manifold. Renewable cylinder liners and leakproof, continually-cleanable force-feed lubrication in larger sizes. Positive manual or automatic capacity control. Available in self-contained compressor-condenser units.

Worthington Air-Handling Units. Perform complete air conditioning functions. Water cooling or direct expansion. Five sizes: 4 to 60 tons, 4000 to 13,500 cfm. Horizontal or vertical. Sectional design.

Worthington Evaporative Condensers. All parts exposed to moisture made of zinc-coated steel, bonderized and coated with rubber-base enamel containing special rust inhibitor. Prime surface—no fins to clog. Staggered coils permit air deflection and complete wetting. Six sizes from 2000 to 27,000 cfm.

Also: *Worthington Evaporative Coolers* in same range.

*Reg. U. S. Pat. Off.

Bulletins containing complete information are available

First Completely Air-Conditioned Apartment House in New England

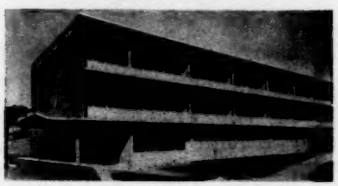
Beacon Towers Apartments, Brookline, Mass. is the first building of its type in New England to be 100% air-conditioned.

E. A. Berman Company of Boston, under the direction of M. L. Cail, installed a three-zone cooling water system for the 34 apartments. Individual room units are served by a refrigeration unit consisting of a Worthington Freon-12 compressor, evaporative condenser and water chiller.

The system is designed and operated for automatic heating in winter and cooling in summer.

Experience of the owners has been that the air conditioning helped to lease the apartments for 3-year periods.

Laboratory Air Conditioning Duplicates Mill Conditions



Worthington also manufactures a complete line of *centrifugal* refrigeration.

When the W. Harrison Hightower Textile Engineering Building was built at the Georgia Institute of Technology, Atlanta, to house its textile school, Worthington refrigeration for air conditioning was installed to provide the proper temperature and relative humidity required for textile processing.

Fourteen separate rooms are individually air-conditioned, through a chilled water system, from a 150-ton Worthington centrifugal refrigeration system, electrically-driven. This machine is equipped to shut off automatically in the event of trouble anywhere in the system.

Installed by Engineering Contractors, Atlanta, Ga.

WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A-1.1

profit by installing
Streamline®
ALL COPPER SUPPLY AND
DRAINAGE PLUMBING
plumbers
The net profits on a STREAMLINE all-copper rough-in are substantially better than on a ferrous system when installed by experienced mechanics. Solder joints make installation much easier, and besides, copper plumbing is in demand by builders and home buyers.
builders
The permanence of a STREAMLINE copper system appeals to home buyers. It costs no more, installed, than a rustable ferrous system. It eliminates complaints because it is permanently trouble-free!
home owners
Copper plumbing protects the owner's investment—the resale value of the building is actually better! At no extra cost the owner gets what he wants—a modern, dependable system—rust proof and virtually clog-free.
STREAMLINE
WROUGHT COPPER FITTINGS
Copper is already on the critical list. For civilian purposes it will not be as generally available as we would all wish it to be. To get further information see your plumbing jobber. For illustrated product literature write for Catalog S-351 and W-250 describing the complete line of cast supply and drainage fittings and the complete line of wrought fittings through 4".
MUELLER BRASS CO.
STREAMLINE PRODUCTS
MUELLER BRASS CO., PORT HURON 2, MICHIGAN

Longer service life at lower final cost

with dependable CRANE VALVES

No. 1610 Diaphragm Valve. Ask for literature on full line through your Crane Branch or Crane Wholesaler.

CASE HISTORY FROM CRANE FILES

PROBLEM: To find a more efficient and economical replacement for plug cocks having an average life of only 2 to 8 weeks in pipe lines handling liquid clay to filter presses.

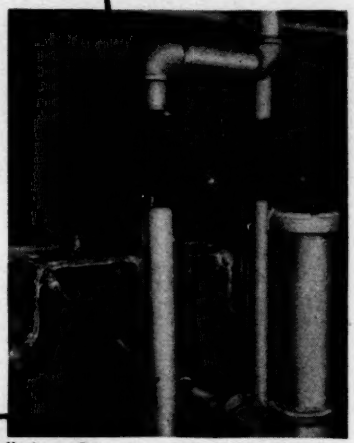
WORKING CONDITIONS: Working pressure 140 psi, with liquid clay flow creating highly erosive effect; also corrosive. Strong tendency to clogging. Operating cycles 5 to 6 per day; relatively quick opening and closing required.

SOLUTION: Crane No. 1610 Diaphragm Valves, iron body, packless design, with separate disc and diaphragm.

RESULT: After 11 months' uninterrupted service, Crane valves showed no significant wear or damage resulting from normal operating conditions. User assured of greatly reduced maintenance and replacement costs over plug cocks. No 1610 Diaphragm valves approved for standardization on all filter press piping.

Another example of the greater value in Crane Quality, and the lower final cost of Crane Valves for every service. That's why . . .

More CRANE VALVES are used than any other make!



The installation—Onondaga Pottery Co., Syracuse

CRANE

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Tri-Flex Aerovane ..in the First National Bank of Tulsa

The selection of the distribution equipment for an air conditioning system depends on just two factors . . . performance . . . appearance. And two good reasons indeed why in Tulsa's beautiful new First National Bank Building there was no question about the choice of grilles and registers . . . Tri-Flex for supply . . . Aerovane for return. Unmatched in performance . . . maximum flexibility to meet the most rigid requirements of air delivery. Unmatched in appearance . . . styled to harmonize with whatever the interior design or decor may be. When you specify Tri-Flex and Aerovane, you can be sure of the results.

TUTTLE & BAILEY INC

Engineered Products for Air Conditioning, Heating and Ventilating

NEW BRITAIN, CONNECTICUT

4TB51

NABISCO

selects SARCO

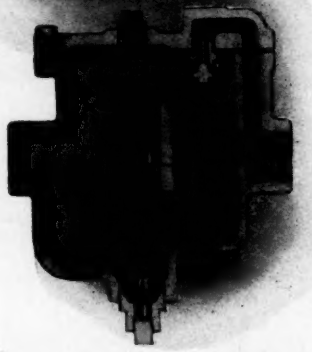
For LARGEST BAKERY on the Pacific Coast

This beautiful, modern bakery just completed by National Biscuit Company in Portland, Oregon, features many innovations. For example, the large tower at left is designed for the storage of raw materials. Each baking unit measures over 600 feet from cutting machine to packing department. The new plant greatly augments NABISCO's service to food merchants and consumers in the expanding Pacific Northwest.

Four types of SARCO STEAM TRAPS are used

Sarco furnished, for the heating system, four different types of steam traps, including a large number of the inverted bucket type as illustrated.

Efficient steam trapping, of course, depends upon the selection of the right type of trap for the particular job. Sarco is the only manufacturer offering a selection of four major types of steam traps, namely: inverted bucket, thermostatic, float-thermostatic and liquid expansion. Write for trap selection chart No. 1600.



SARCO INVERTED BUCKET STEAM TRAP

Since 1936 made with built-in strainer.
All mechanism on cover for easy inspection.

Engineers & Architects: Ford, Bacon & Davis, New York.
Contractors: Buchanan Co., Inc., Portland, Oregon

No. 334

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

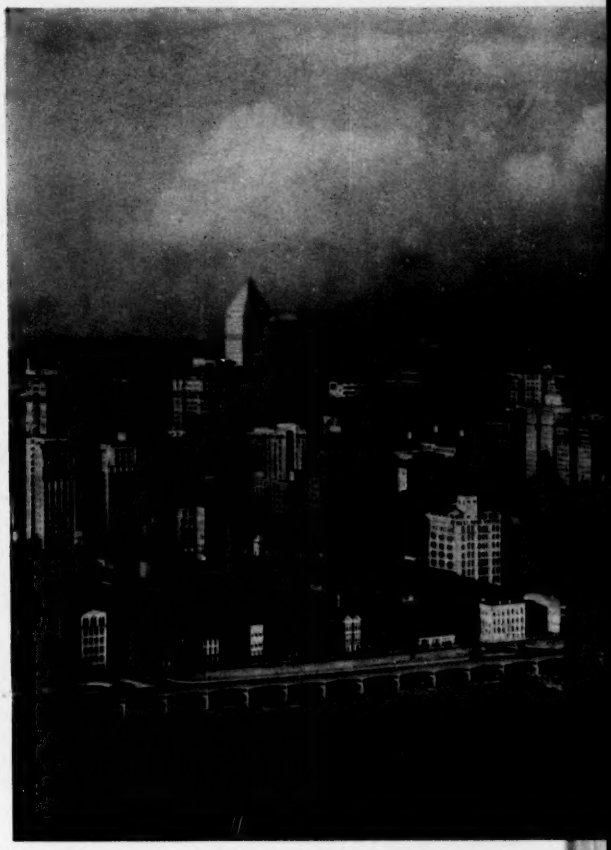
SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

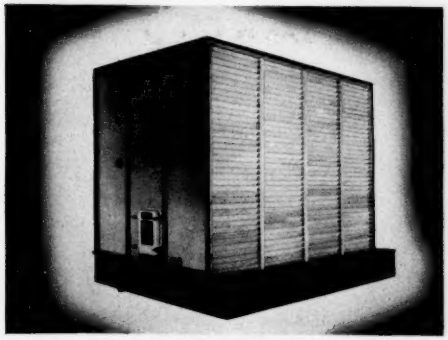
American Blower—a time-honored name in air handling



All air handling equipment is not alike. There's a vast difference in quality, design, quietness, operating costs and efficiency. Look before you buy—and you'll buy American Blower products, the accepted standard and proved in test after test by buyers.

In Pittsburgh, as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the Pittsburgh area, call American Blower—Atlantic 1-3496. In other areas, consult your phone book.

Product of the month



American Blower Class 8 Air Washer and Dehumidifier

Cleaner, fresher air for your business!

Clean, washed air, properly humidified, is an asset to any business, especially during the hot summer months.

That's why we're placing special emphasis this month on American Blower Air Washers and Dehumidifiers.

Three standard classes are available: the Class 8 Air Washer and Dehumidifier—a highly efficient heavy duty unit with two banks of sprays in a casing 96 inches long; the Class 6 Air Washer—a single spray bank, intermediate capacity unit in a casing 72 inches long (this unit is ideal for most types of evaporative cooling and air cleaning jobs); the Class 4 Air Washer—a compact and economical single spray bank air washer with 48-inch casing length. It's designed specially for effective evaporative cooling and air washing in a minimum space.

In all, 86 standard sizes are available with capacities ranging from 5,550 to 117,350 cfm. For details, ask the nearest American Blower Branch Office.

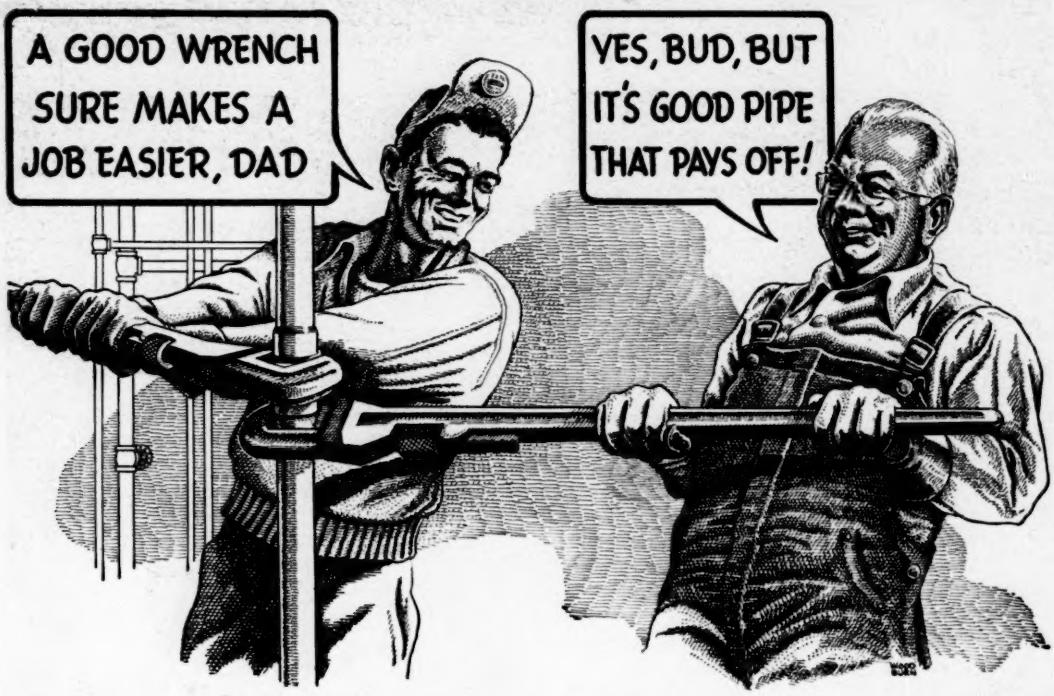
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



Good workmen + good tools + GOOD PIPE = GOOD JOB!

7 POINTS OF UNIFORM GOODNESS IN YOUNGSTOWN STEEL PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

EVEN the hardest jobs are easier when you work with Youngstown pipe. That's because Youngstown pipe is consistently uniform - uniform in lengths, uniformly round and straight, uniformly threaded, uniformly soft and ductile, yet uniformly tough and strong. "Youngstown" rolled into every length is the sign of GOOD PIPE.

THE YOUNGSTOWN SHEET & TUBE CO. 1900 YOUNGSTOWN 1950 50 YEARS OF SERVICE

Youngstown STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY — General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel — Export Office - 500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS · WIRE · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · HOT AND COLD FINISHED CARBON AND ALLOY BARS · RODS · SHEETS · PLATES · CONDUIT · RAILROAD TRACK SPIKES.

Pump controllers

Highly perfected and proved in thousands of installations, the McDonnell No. 150 is the pump control for boilers with steam pressures up to 150 lbs. Convenient terminals provide circuits for pump motor (or starter), for low water cut-off of burner, and, when desired, for low water alarm. No. 157 (at right) is the same dependable control with integral water column which greatly cuts cost of installation under many conditions.

Receiver tank make-up feeders

To provide make-up water when insufficient condensate is returned to the tank, dependable McDonnell make-up feeders are available. Simplest form when adaptable is the No. 21 series (at left) which is installed right in receiver tank and feeds water directly. Four flange shapes and sizes are provided in this series (Nos. 21-121-221-321) to fit openings in most tanks. The No. 421 (at right) takes care of conditions where installation with equalizing piping is necessary. These quality feeders seat drip-tight against high water pressures.

—but no need to SCRAM with dependable boiler water level control

A steam boiler without automatic boiler water level control is strictly a "Sam-you-better-scram" deal. But there's no need to scram when the job of safeguarding the boiler is taken over by the simple hook-up diagramed above.

It will pay you to study this diagram for a moment and note how the water level (the feed pump) is controlled from the water level itself by a McDonnell No. 150 or 157 pump control. This modern method holds the water level within the close limits that steps up efficiency . . . pays for the control.

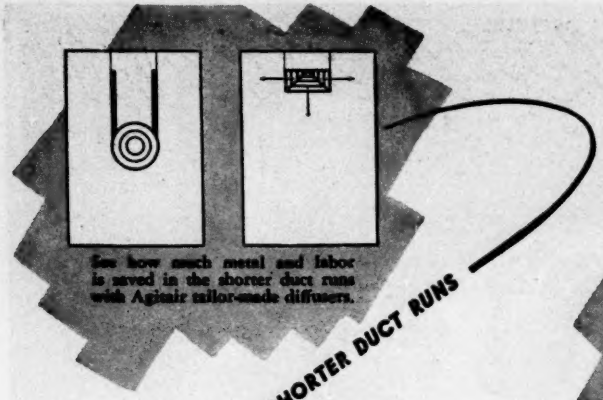
An extra switch on the control provides circuits for low water fuel cut-off and low water alarm if a fuse should blow in the feed-pump circuit. The McDonnell make-up feeder on the receiver tank maintains a minimum level in the receiver tank at all times.

Note the facts opposite about the dependable McDonnell equipment that will give you this protection and increased efficiency. Ask for data sheets covering every detail of the simple installation and wiring.

M&M DONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

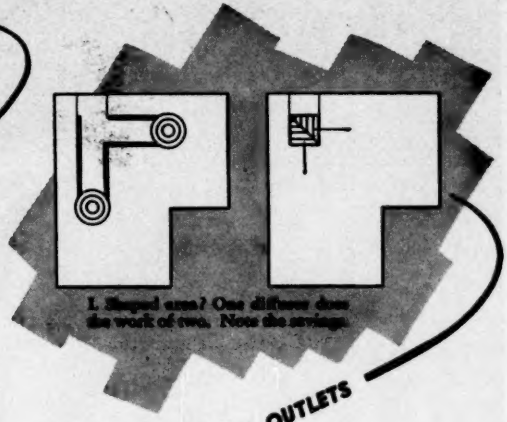
Doing One Thing Well

McDONNELL



See how much metal and labor is saved in the shorter duct runs with Agitair tailor-made diffusers.

SHORTER DUCT RUNS



1. Shaped area? One diffuser does the work of two. Note the savings.

FEWER OUTLETS

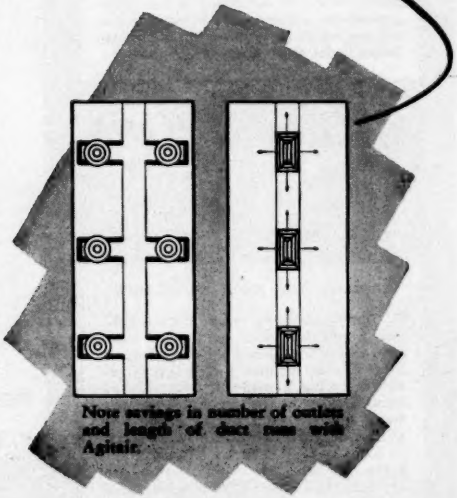
Save Metal...

Cut Costs...with

AGITAIR®

SQUARE & RECTANGULAR AIR DIFFUSERS

CONSERVE CRITICAL MATERIALS



Note savings in number of outlets and length of duct runs with Agitair.

Compare the diagrams on this page and you'll understand why today — more than ever before — it's important to specify AGITAIR Type R. They are the only diffusers that may be assembled in a variety of patterns to provide blows in one — two — three and four directions, with discharge orifices proportional to the area being served. Yes — you can help overcome the metal shortage and reduce the cost of duct work — *without reducing the efficiency of air distribution.* Specify AGITAIR . . . the only air diffuser tailor-made for each application.

Write for Complete Data

AIR DEVICES Inc.

17 East 42nd Street **New York 17, N. Y.**

Air Diffusers • Air Filters • Roof Exhausters

The Only Air Diffuser Tailor-Made for Each Application

AMERICAN-Standard

First in heating . . . first in plumbing

The EMPIRE and the STANDARD

engineered to supply economical, automatic heat for homes of all sizes

No matter what the size of building to be heated, one of these gas fired boilers—the Empire or the Standard—from the American-Standard line can handle the job. Both of these outstanding units have been so designed and coordinated by our engineers that they offer maximum heat output under all conditions.

The **EMPIRE** Gas Boiler is one of the most striking gas fired boilers on the market. Its colorful jacket is the smart American-Standard Forge Red which catches the interest of all who see it on your sales floor . . . and its compact design makes it an attractive installation in any basement. The boiler is constructed of durable cast iron and is equipped with precise, dependable controls to assure lowest operating and maintenance cost compatible with ample comfort. Important among these controls is the Automatic Gas Valve, operated by the thermostat to maintain desired room temperatures effortlessly and economically. To increase the unit's efficiency still further there is a thick layer of insulation under the trim jacket, which prevents excessive heat loss into basement and reduces operating cost. The Empire comes in models for basement or first floor installation.

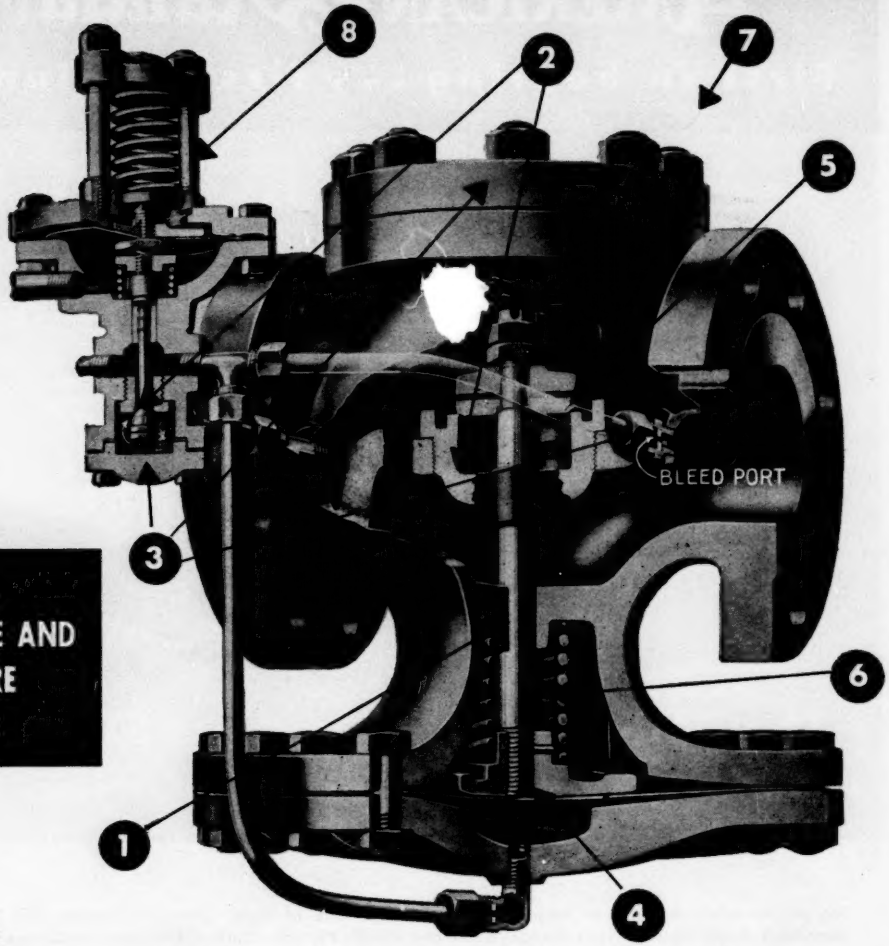
The **STANDARD** Gas Boiler has the same design features and precision controls as the Empire, but is supplied—at a somewhat lower cost—with a jacket which does not conceal all controls. It can be used to heat homes, and is also available in larger units for installation singly or in battery in all types of buildings.

These boilers and other American-Standard products are sold through selected Wholesale Distributors to Heating and Plumbing Contractors. **American Radiator & Standard Sanitary Corp.**, P. O. Box 1226, Pittsburgh 30, Pa.

LOOK FOR THIS MARK OF MERIT

Serving home and industry

THESE SPENCE FEATURES *Reduce*



A TYPICAL
SPENCE PRESSURE AND TEMPERATURE REGULATOR

LESS DOWN-TIME of the system! Less time and money wasted on replacement of parts! Thousands of installations throughout the country have proved that Spence Self-Operated Regulators stay "on the line" . . . provide *dependable, trouble-free* pressure and temperature control. Users know these precision-engineered Spence units rarely need extensive repairs or special attention. Here are a few of the Spence design features that help keep *maintenance at a minimum:*

1 **PACKLESS CONSTRUCTION**—All Spence main valves and most pilots are built without stuffing boxes. This packless construction saves many maintenance man-hours because it eliminates the need for closely fitted parts which may stick or bind due to uneven expansion or foreign matter.

2 **EASY TO CLEAN**—The seat and disc of the main valve and pilot can be cleaned and any working part removed *without taking the main valve out of the line.*

3 **NO DISMANTLING FOR INSPECTION**—Special openings are provided to inspect the main valve disc, the pilot valve member and the SECO Metal bleedport. Inspection is easier, too, because the pilot is not an integral part of the main valve. The pilot is protected by an accessible built-in strainer.

4 **LONG-LIFE METAL DIAPHRAGMS**—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.

SPENCE PRESSURE *and* TEMPERATURE

Maintenance...Cut Costs

BUILT TO LAST FOR YEARS!

That's the reason Spence Self-Operated Regulators lower over-all costs. Dollar for dollar, you can count on quality performance for a longer period of time. Look at three of many Spence features that assure long regulator life:

5 DURABLE SECO METAL SEATS AND DISCS—Spence seats and discs are made of durable SECO Metal which resists wiredrawing. *More than twenty years of experience* with SECO Metal in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

6 SPRING OUT OF PATH OF STEAM—The spring in the Spence Regulator is out of the path of high-pressure steam or other fluids flowing through the valve. Since the spring operates at low unit stress, it has exceptionally long life.

7 LESS FRICTION—All Spence Regulators are built with *packless* main valves which are actuated by large, balanced diaphragms. This design minimizes friction. Valves remain unaffected by changes in service conditions or length of service.

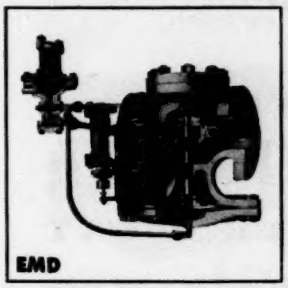
WHY SPENCE UNITS REGULATE ACCURATELY

8 YOU CAN BE SURE of accurate regulation because *sensitive* pressure or temperature pilots control the main valve of every Spence unit. This unique design enables the Spence Regulator to serve many functions and handle all the various types of fluids under a wide range of conditions.

One of the great advantages of this Spence design is the interchangeability of all pilots on all sizes of main valves. Any main valve can be changed from a pressure to a temperature regulator or vice versa *simply by substituting one type of pilot for another.*

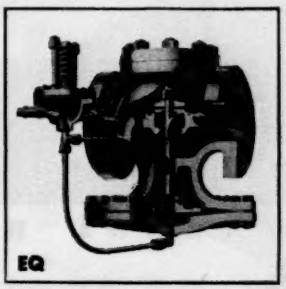
WIDE RANGE OF SIZES

Spence Regulators are built in sizes from *¼" to 12"* for service with *air, steam, water, oil or gas.* With minor adjustments, any Spence Regulator can be easily switched from one service to another.



EMD

E2T100



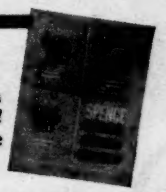
EQ

The Type EMD Pressure Regulator includes a SPENCE Solenoid Pilot to cut it on and off electrically • The Type E2T100 Temperature Regulator in effect is a pressure regulator which is constantly reset by small variations in temperature at the sensitive thermostat. • The Type EQ Back Pressure Regulator is a self-operated, packless unit which controls its own initial pressure. The general construction is the same as the Type ED Pressure Regulator.

PARTIAL LIST OF USERS

- The Cleveland-Cliffs Iron Company
- Tennessee Coal, Iron and Railroad Company
- The Springs Cotton Mills
- Ford Motor Company
- Cochrane Corporation
- Philadelphia Electric Company
- Pennsylvania Power & Light Company
- L. H. Gilmer Company Div. of United States Rubber Co.
- York Corporation
- Jones & Laughlin Steel Corporation
- The Duluth Steam Corporation
- Rochester Gas and Electric Corporation
- Consolidated Gas Electric Light and Power Company of Baltimore
- Phenix Natural Gas Company
- Cutter Laboratories
- National Tube Company
- The Atlantic Refining Company
- Great Lakes Steel Corporation
- Union Electric Company of Missouri
- Todd Shipyards Corporation
- Oxford Miami Paper Company
- Land O'Lakes Creameries, Inc.
- Ohio Edison Company
- General Electric Company
- R. J. Reynolds Tobacco Company

FREE BULLETIN GIVES ALL THE FACTS



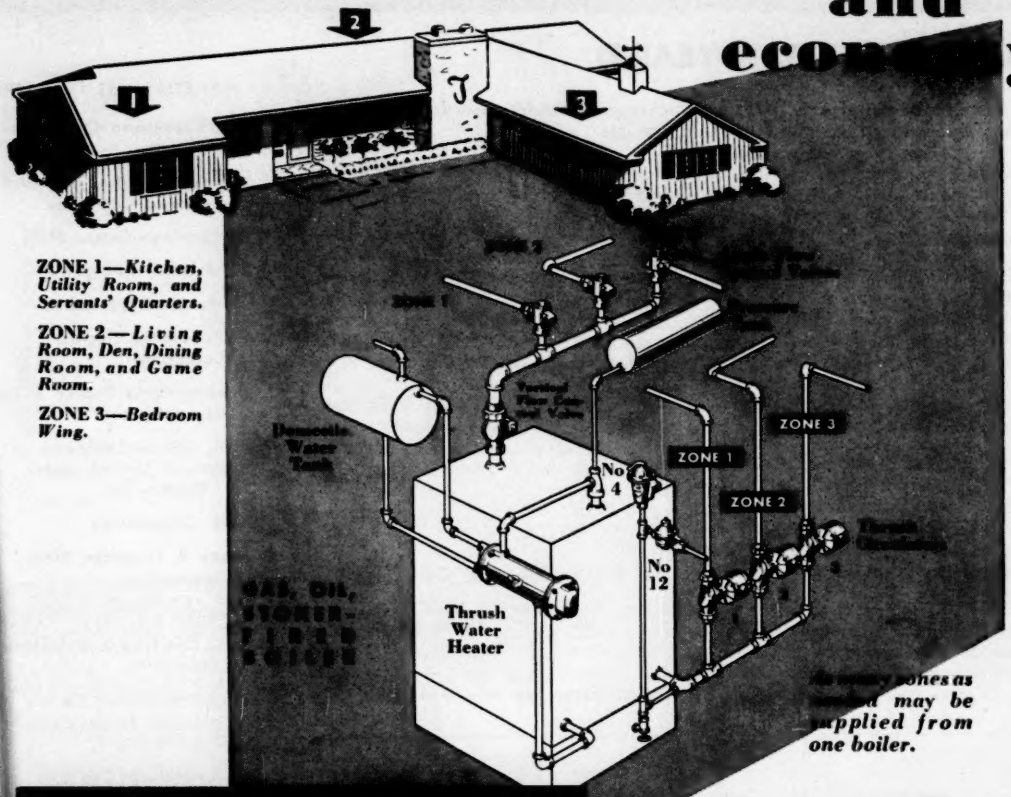
YOU WILL FIND complete engineering details and selection data on Spence Regulators in free bulletin No. 5000. It features a *full color, fully illustrated description of the operating cycle* of a Spence Regulator. Send for your copy of this valuable bulletin today.

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence

REGULATORS

ZONED FOR COMFORT and economy!



ZONE 1—*Kitchen, Utility Room, and Servants' Quarters.*

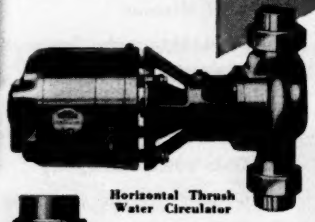
ZONE 2—*Living Room, Den, Dining Room, and Game Room.*

ZONE 3—*Bedroom Wing.*

As many zones as needed may be supplied from one boiler.

THRUSH forced circulating

FLOW CONTROL HOT WATER HEAT



Horizontal Thrush Water Circulator

No. 201 Radiant Heat Control

Vertical Flow Control Valve with air tube.

ANY HOT WATER heating plant may be zoned easily and inexpensively with Thrush Flow Control System, to supply as many zones as are needed from a single boiler. These zones may be in the same house or in adjacent buildings, often greatly reducing equipment cost because the one boiler replaces many. Only a Circulator, with Relay Transformer, Flow Control Valve, and a Radiant Heat Control are added for each additional zone . . . simple units which give dependable and individual comfort control in each zone. Thrush Water Heater eliminates the need for separate domestic water supply as the same heating boiler automatically provides plenty of hot water for kitchen, laundry and bath summer or winter. Ask your wholesaler today for more information or write Dept. D-4 for bulletin on Zoned Heat.

H. A. THRUSH and CO.
PERU . . . . . INDIANA

BRUNNER SINCE 1906 REFRIGERATION helps you serve better

Maybe we can help if you are having trouble finding the units you need!

With 69 different models, types and capacities of refrigeration condensing units being built on regular production schedules in the Brunner plants, you have more assurance of getting exactly what you need, and when you need it, without wasting time hunting.

What's more, we offer you the help of experienced factory field men backed by an able engineering staff who have encountered and answered just about every kind of refrigeration or air conditioning problem imaginable.

With so much to offer folks engaged in the commercial refrigeration business, it just doesn't make sense to deprive yourself of the advantages that come with recommending and installing Brunner's as a regular habit.

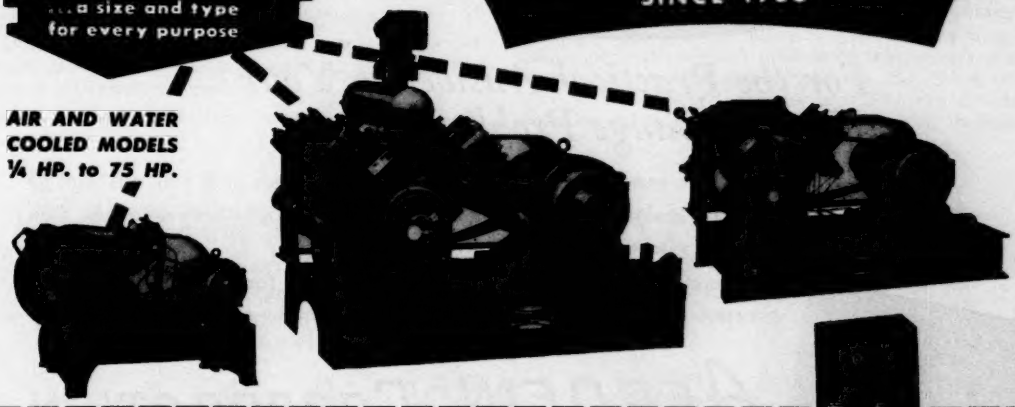
BRUNNER MANUFACTURING COMPANY, UTICA 1, N. Y., U. S. A.

P.S. *As a business man you should talk to a Brunner factory sales engineer. It costs nothing to listen, and you may discover that you have been missing a good bet. Your name and address written on the margin of this ad and mailed to us at Utica is all that is necessary.*

REFRIGERATION CONDENSING UNITS ...a size and type for every purpose

BRUNNER SINCE 1906

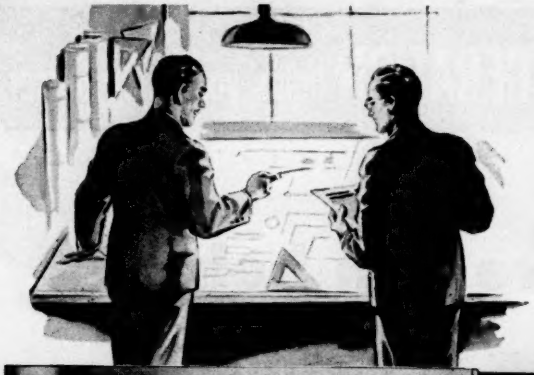
AIR AND WATER COOLED MODELS ¼ HP. to 75 HP.



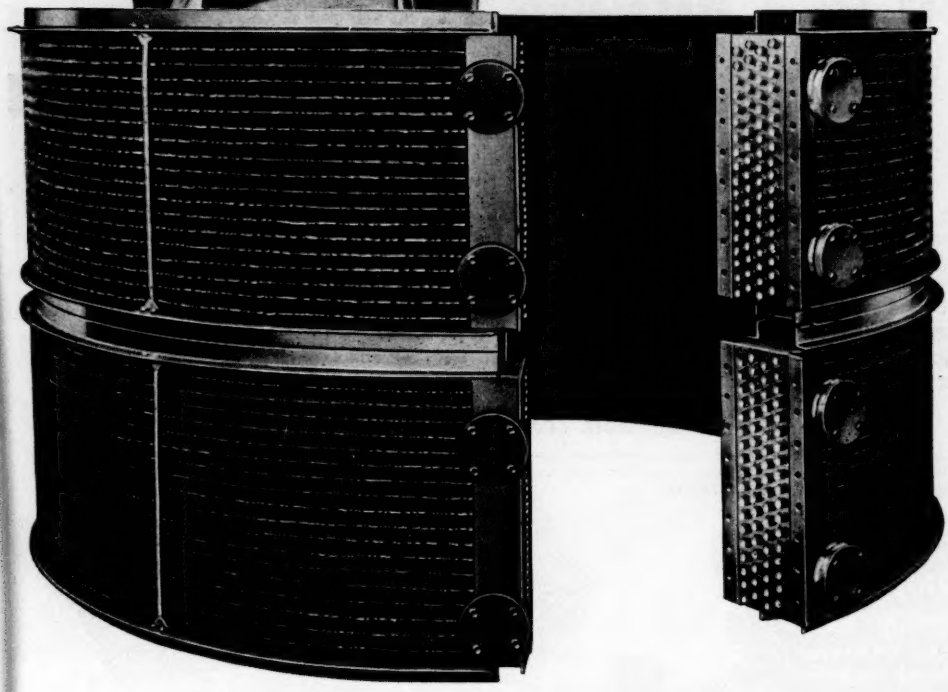
BRUNNER SINCE 1906

AIR CONDITIONING

Self Contained Units in 4 sizes: 3-5-7½ and 10 HP.
Remote Installation Types from 3 to 75 HP.



"Ask the AEROFIN Man"



For the Practical Answer to Your Heat-Exchange Problem . . .

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

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Bundyweld Tubing shines in better radiant heating systems

Shines in *on-the-site* fabrication, too.

Bundyweld is the only tubing double-walled from a single strip, with an exclusive beveled edge. It is copper-brazed, perfectly bonded through 360° of wall contact, into a solid-walled tube with thinner yet stronger walls. It is held to close tolerances.

Scale-free and smooth inside and out, Bundyweld arrives at the building site in twenty-foot lengths, with one end expanded if specified.

One man quickly bends grids on a simple wood or metal form and joins them by soft or silver soldering. Two men easily position the lightweight, rigid, joined grids. Bundyweld shines, too, in your radiant heating systems. It's extra sturdy with a margin of safety against leaks or bursts under normal pressure. Its thinner wall radiates heat faster for more effective performance. You can already see that Bundyweld offers many unique performance and fabrication advantages that mean time, work, and money saved. But there are more. Check *Sweet's Architectural File* for details. Or write us. ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

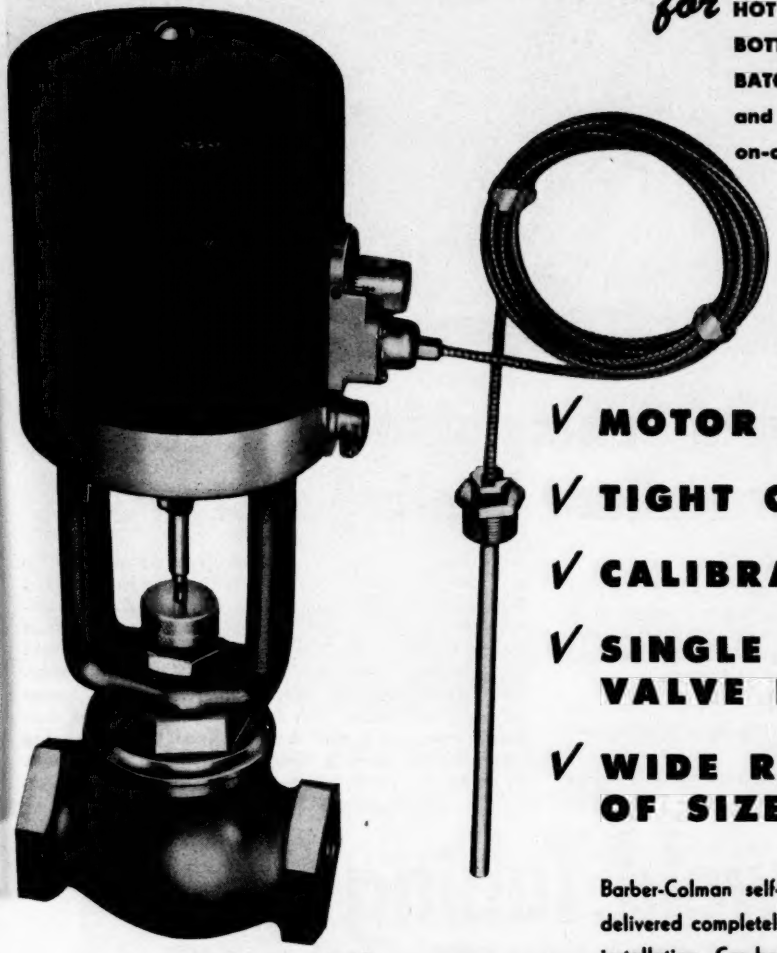
NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

ELECTRICALLY OPERATED

BARBER COLMAN

TEMPERATURE REGULATORS

for HOT WATER STORAGE TANKS
BOTTLE WASHERS
BATCH KETTLES
and other two-position on-off applications



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CHECK THESE SPOTS
✓ STEAM RADIATORS
✓ UNIT HEATERS—
✓ PIPE COILS ✓ DOWN-FEED RISERS ✓ CONDENSING RADIATORS
✓ BLAST COILS
✓ ENDS OF STEAM MAINS, ETC.

Sediment accumulations, worn seats and pins, "dead" thermostats—any one of these may be causing a serious loss of steam. The only way to guard against this waste is to open up your traps—*once a year at least*—and eliminate the troublemakers. Remember that the tiniest steam leak, during a year's operation, can waste an unbelievably large amount of fuel.

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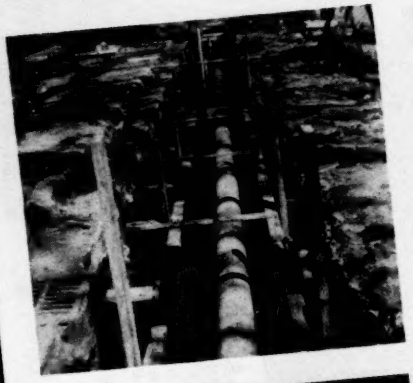
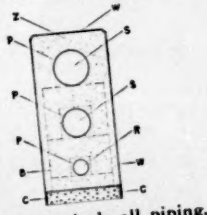
"Z" crete

The for all

An easier, more economical way to insulate any size, number or arrangement of underground heated pipes.



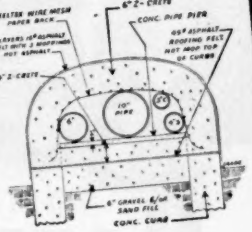
NEW HAMPTON, IOWA MUNICIPAL STEAM-HEATING SYSTEM



Z-Crete Underground Pipe Insulation was selected for the new steam distribution system at New Hampton, Iowa. Illustrated at the left is the 3-pipe system anchored into the structural concrete base. Forms were next placed and Z-Crete Insulation poured around the piping.

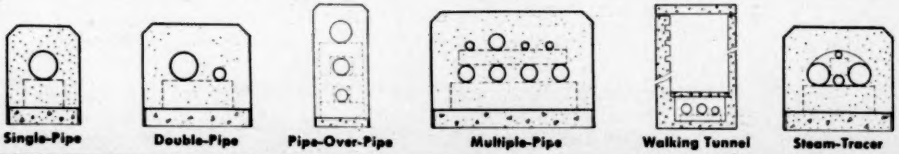
Letters indicate the following: Z — Monolithically poured Z-Crete Insulating Concrete completely embeds all piping. W—Curing and waterproofing membrane all sides insulating concrete. B—Pre-cast pipe support blocks approximately 8' on centers. P—Parting medium applied to pipe to prevent bond of concrete to pipe. S—Steam main and R—Condensate return pipe. C—Structural concrete base pad runs continuously under conduit.

BARBER OIL COMPANY USES Z-CRETE FOR ON-GRADE STEAM-TRACED OIL LINES



The W. H. Barber Co., a leading oil producer, recently built a new tank farm in St. Paul. The oil lines were placed on grade and traced with low pressure steam. In low pressure steam tracing, the entire pipe assembly is wrapped with a paper-backed wire mesh. Z-Crete is then poured to the desired thickness and the conduit is finished off with felts and hot mopping of asphalt. (See details in diagram.) MacArthur Co. of St. Paul, installed the Z-Crete.

FOR ANY HEATED UNDERGROUND SYSTEM, USE Z-CRETE

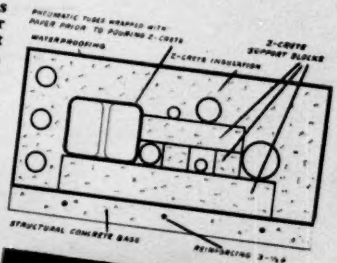


modern, monolithic insulation underground heated piping!

View of the conduit ready for insulation with Z-Crete.

MULTIPLE-LINE Z-CRETE CONDUIT FOR MAYO CLINIC, ROCHESTER, MINN.

An unusual Z-Crete conduit was recently built in Rochester, Minn. for the famed Mayo Clinic. One conduit carries *ten lines* for a variety of uses, including high and low pressure steam, hot water, and pneumatic tubes. Notice the unusual arrangement of pipe support blocks in diagram at right. The engineer was Ellerbe & Co., St. Paul.



Z-CRETE INSULATES 606-UNIT DELAWARE HOUSING PROJECT

More than 4,000 feet of underground heating and hot water piping were encased in Z-Crete Insulation in the Monroe Park Apartments in Wilmington, Delaware. The Monroe Park Construction Co. expressed doubt that a central heating system could have been used without Z-Crete Underground Insulation. A multiple pipe installation, this central heating system covers every part of the extensive project. Insulating Concrete Corp. of Washington, D. C., installed the Z-Crete conduits. The general contractor was the Monroe Park Construction Co.

Air view of 606-unit Monroe Park Apartments which receive their heat and hot water through Z-Crete underground conduits.

"Z"crete Cast-in-place conduit is...

- **MORE ADAPTABLE**—Any number, any size, or any arrangement of pipes can be designed into one conduit.
- **MORE ECONOMICAL**—Particularly in large pipe or multiple pipe conduits. No prefabricated units, no metal parts, no drainage is usually required.
- **PERMANENT**—Z-Crete will not rot or deteriorate, even if wetted. It is resilient, fireproof.
- **EFFICIENT**—Solid monolithic insulation directly around pipes with no voids in conduit eliminates heat loss due to air movements. Six inches of insulation assures good overall efficiency.
- **MORE WATER RESISTANT**—Solid monolithic water repellent insulation assures a restricted water movement. No joints—no voids in the conduit—hence water is less apt to collect around pipe. Z-Crete is inert and dielectric. It is a pipe protector as well as a pipe insulator.
- **READILY AVAILABLE** — No critical materials. Experienced, licensed applicators, located in all parts of the country, are ready to serve you.

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Write today for full details and specifications on Z-Crete, the key to easier, better insulation of underground heated piping.

**Z-Crete is the registered trademark of Zonolite Company*

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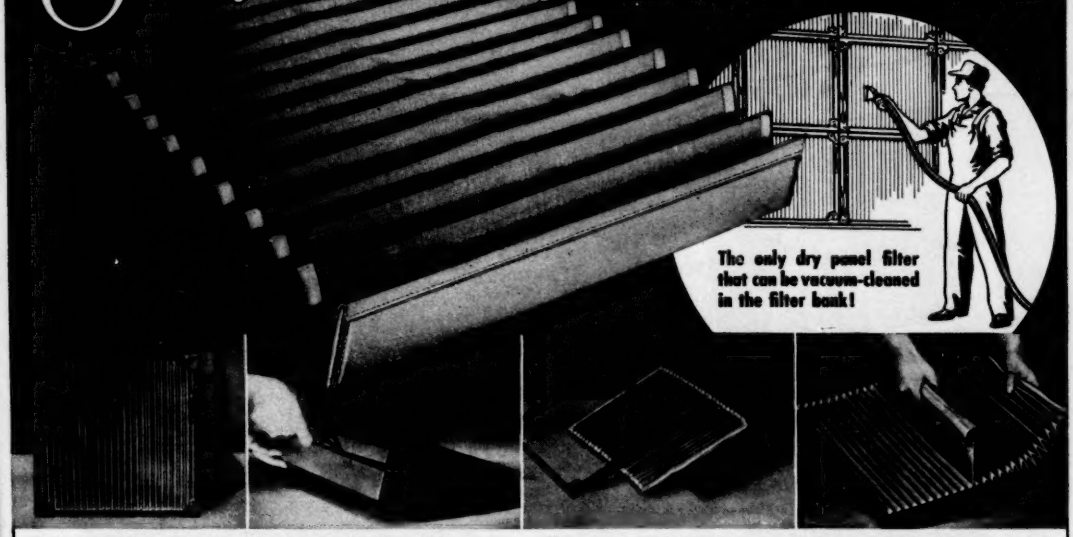
Staynew DRY PANEL FILTERS

Feature Pre-formed, Wire-clad Inserts



Cell removed from frame by sturdy offset handles after releasing locking cams.

Removing pre-formed Insert is simple. Snap catches are released, cover lifted off, Insert lifted out.

Dis-assembled cell showing removable cover, Insert and box containing permanent fin support.

Insert easily slipped on permanent fin support by means of special Staynew Loading Knife.

. . . *pre-formed* so that Inserts can be slipped on or off the permanent fins in seconds! . . . *wire-clad* for complete protection of medium and maximum fire resistance! . . . *Class I Underwriters' Approval* in bonded glass!

FIN CONSTRUCTION provides the greatest possible filtering area in available space. Resistance in relation to dust load is less than in panel filters built on any other principle.

OPERATING ECONOMY is amazing. The most fragile medium can be cleaned repeatedly either by vacuum or fluid (dry-cleaning). Insert replacement cost is very low.

STAYNEW DRY PANEL FILTERS are *versatile* . . . utilizing any medium in sheet form that can be crimped. Stock media include wool felt, rayon-cotton-wool felt, bonded glass, and Feltex. The latter is a surprisingly low cost, highly efficient medium.

INSTALLATION can be in flat or V-banks, frames riveted but individual cells removable in a matter of seconds. All standard sizes are available in 2", 4" and 8" depths.

FOR EVERY DRY PANEL NEED there is a Staynew model and medium for maximum efficiency at minimum cost.

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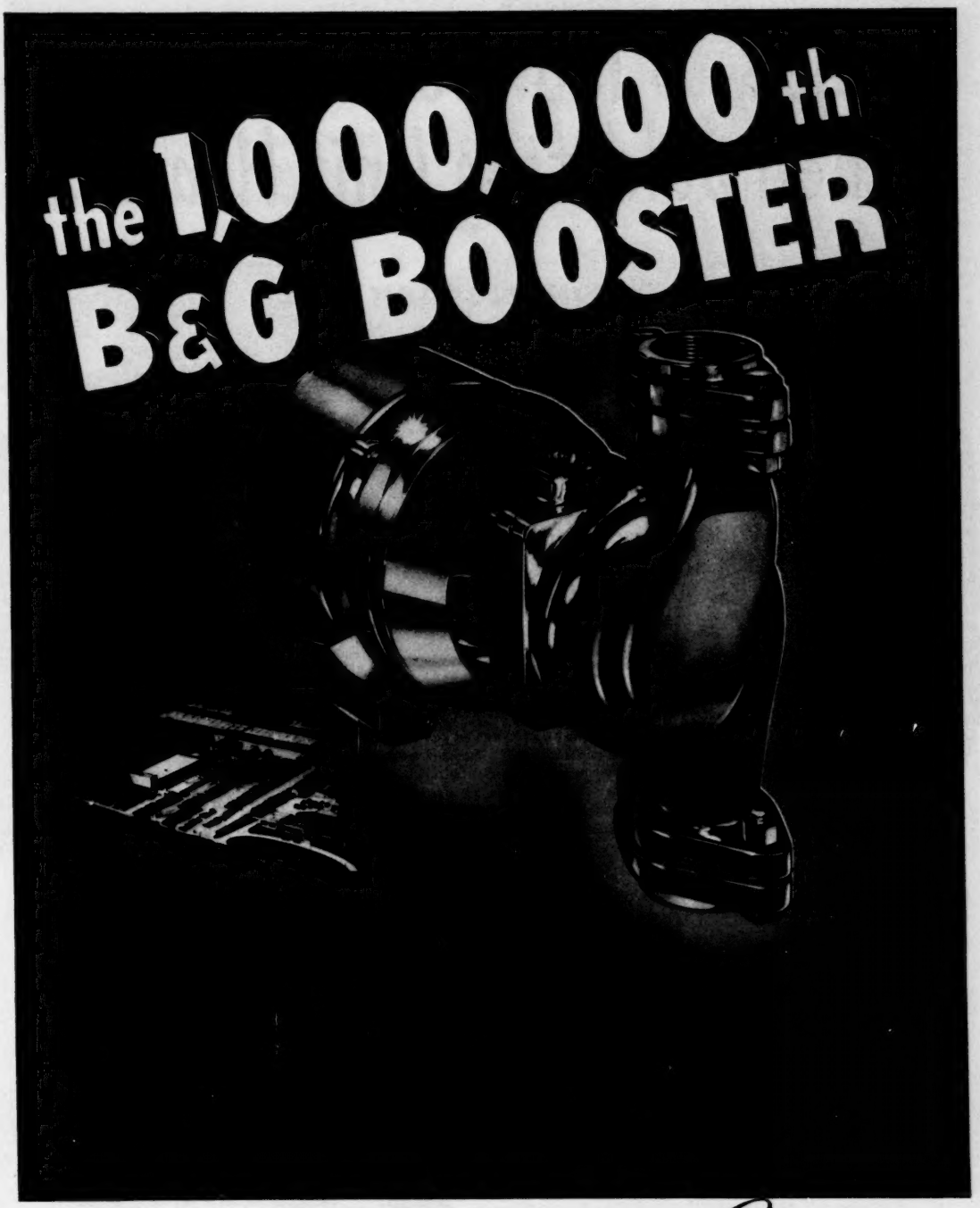

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It pays to look for these clues when selecting Unit Heaters

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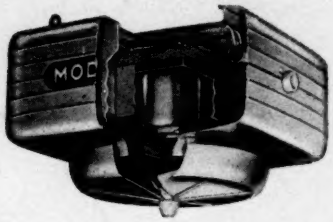
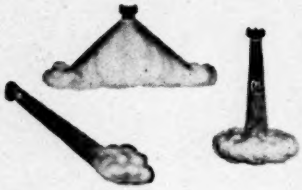
Modine Unit Heaters are designed and built to give long-term, trouble-free service. Steam-carrying passages are corrosion-resistant. Cylindrical tubes and headers are brazed at the joints for extra strength to resist pressure. Individual expansion bends absorb differential stresses. Parker-Bonderizing protects casings against rust.



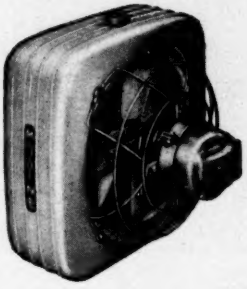


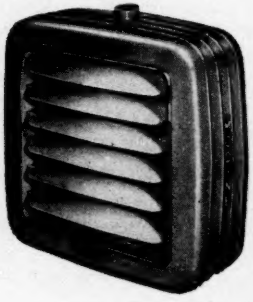
EXAMINE PERFORMANCE

Top heating performance — that's what you get with Modines, whether you specify the *Horizontal, Vertical* or *Power-Throw* model. Uniform comfort is assured because Modine Unit Heaters have the correct combination of outlet air temperature, volume and velocity.

EXAMINE ECONOMY

Excellent heating performance at *minimum cost* . . . that's another big bonus Modines give you! Impartial tests prove that Modine Unit Heaters save up to 25% in fuel costs over direct radiation under identical operating conditions. And by operating only the fans, Modines provide economical, refreshing air circulation in spring and summer.





Consider the evidence and you'll want Modine

Check all the angles before you buy — and you'll select Modine Unit Heaters. In factories, shops, stores — wherever Modines are used, they establish an outstanding reputation for trouble-free service. Your nearest Modine representative will gladly give you more facts. Or write direct. Modine Mfg. Co., 1511 Dekoven Avenue, Racine, Wisconsin.

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Bring on your severe conditions—

YOUR FIRST CHOICE for *severe service* conditions in piping is the TUBE-TURN Welding Neck Flange. It is engineered with a long tapered hub and a smooth transition in thickness to the pipe-end bevel. This means greater pressure-containing capacity under extreme temperature as well as much longer life than other types when repeated pipe bending or severe vibrations are involved.

For other jobs choose from these TUBE-TURN Welding Flanges: slip-on flanges; lap-joint flanges; socket-welding flanges; blind flanges; orifice flanges; pipeline non-standard flanges. Get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Write Dept. B-4 for free booklet, "Research on the Cyclic Life of Piping Systems."

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Underground tunnels at Cleveland's City Hospital contain the old and the new in piping. New 125-pound steam main (Fig. 1) serving several new buildings is welded. A welded system with TUBE-TURN Fittings was chosen to cut installation time, and to get tight, leakproof joints.

New welded line (Fig. 2) elbows neatly over an older pipe. When space is confined like this, welding is the answer. Contractor welded pipe from 2" up to 12" in tunnels, boiler room and power house.

With welding equipment on the job it's easier to put up pipe supports too. Eyebolt (Fig. 3) is quickly welded to TUBE-TURN Elbow, support rod hooked through it. This steam line to the water heaters must be secure.

Insulation on the maze of piping to the boiler feed pumps (Fig. 4) went up fast, with no flanges to work around. In such close quarters a neat design and reduced space requirements are especially important. And with the pipe welded to TUBE-TURN Fittings, joints won't leak, and insulation will last.

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Fig. 1. Welded underground steam main.

Fig. 2. New welded piping fits in small space.

Fig. 3. Support on steam line elbow.

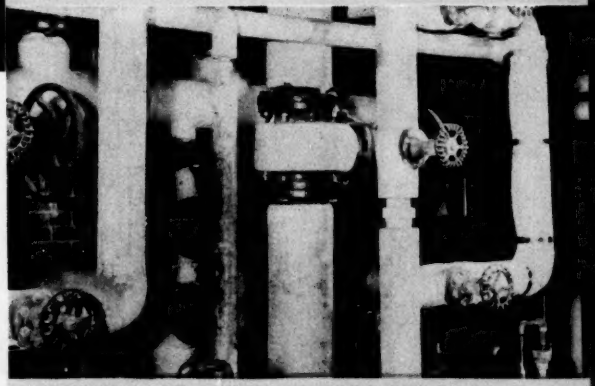

Fig. 4. Insulated welded piping.

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air diffusers

Kaufmann's Department Store, Pittsburgh, Pa., uses 3,500 Kno-Draft HPC Air Diffusers. Units are installed 7 feet apart on 7′ x 14″ ducts, which are located 20 feet apart and mounted about 9 feet from the floor. In spite of the small, space-saving ductwork, thorough, draftless distribution of air is obtained.

Kno-Draft Type HPC High Pressure Air Diffusers are brand-new in principle, but already *proved* in service. Operating at high pressure and velocity, they provide draftless distribution of air to large open areas but require only small, uniform, exposed ducts. As developed for Kaufmann's Department Store in Pittsburgh, the Kno-Draft Type HPC High Pressure Air Diffuser—

1. **Saves** space; uses small, uniform exposed ducts.
2. **Operates** at high pressure and velocity —allows 3000 fpm velocities and 2″ static pressure in ducts.
3. **Achieves** high air induction, draftless distribution—primary air 25° colder than room air.
4. **Provides** complete adjustability to any volume between 90 and 180 cfm, or may be totally shut off.
5. **Functions** perfectly in department store and general office applications.

A new type perforated damper, combined with an interior baffle and jet exit, permits the high pressures and velocities necessary. For a detailed description of the new Kno-Draft Type HPC Air Diffuser—how it works and its application possibilities—mail the coupon today.

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This heating unit sells more *living* room

Bryant Model 324 Forced-Air Furnace, with *Hevigage* 12-gauge steel heat exchanger. For all gases. A.G.A. inputs: 65, 85, 100 and 125 thousand Btu per hour.

A truly great space saver like the Bryant *Hide-away* Gas Forced-Air Furnace adds real value and *appeal* to a house. It can be tucked away in the attic or suspended from ceiling or under the floor, releasing for storage, utility or *living* all the valuable space usually occupied by conventional heating equipment!

The *Hide-away* offers typical Bryant dependability and gas economy, with positive automatic control. Casing temperatures are *low*. Installation-wise, you get ease of handling, and structural steel mounting channels provided can also be used to suspend the unit when it is so installed.

Sell more *living* space and better *heating* at the same time with the Bryant *Hide-away* Forced-Air Furnace! For complete details, contact the Bryant Distributor nearest you or write direct. Bryant Heater Division, Dept. 163, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.

Let the pup be furnace man ... and water boy, too!

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. . . for Commercial and Industrial Heating

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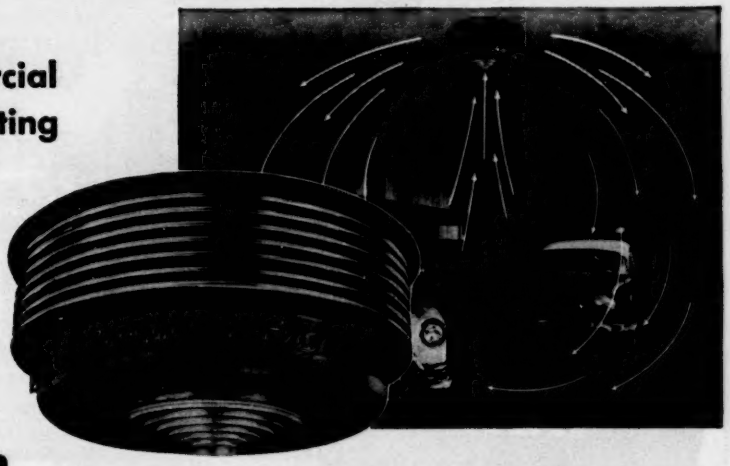
(U.S. Patent #2519496)



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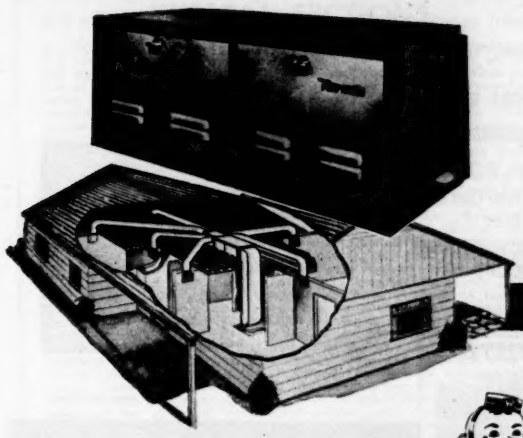

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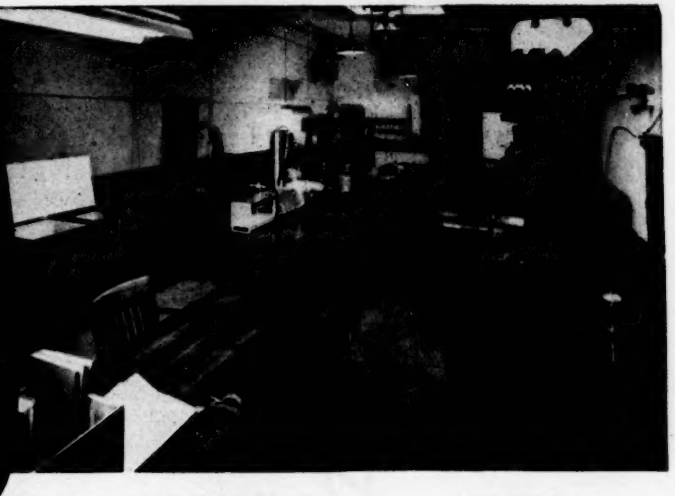
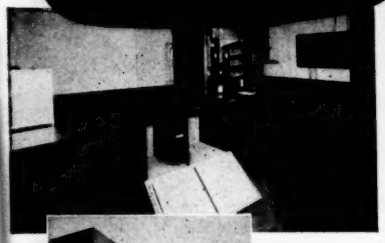
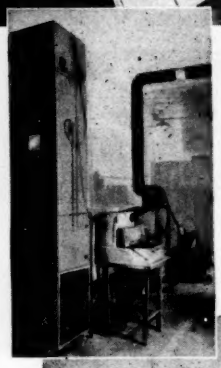
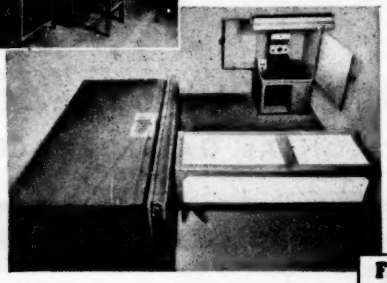






Views of laboratory facilities available to you at the Farr Company



Farr Company Engineers offer complete laboratory services to bring you better air filtration...

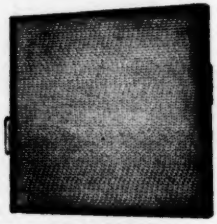
Your air conditioning system deserves the best in air filters and standard FAR-AIR* filters will meet most of your requirements. However, if you are faced with unusual dust conditions, Farr Company's well-equipped laboratory will help you select the proper type of filter to meet your particular problem.

These laboratory facilities are also used to constantly improve the FAR-AIR line to assure you of getting the very best air filtration when you install FAR-AIR products.

Send in your air filtering problem today or write for information on the complete FAR-AIR line.

Typical users of FAR-AIR equipment include:

Thomas A. Edison Co.
W. K. Kellogg Co.
Lever Bros. Co.
Pillsbury Mills, Inc.
Swift & Co.



FAR-AIR FILTERS

"Better by Farr"

*Trade Mark Reg.

FARR COMPANY

Manufacturing Engineers

Los Angeles • Chicago • New York

Mf'd under license by Control Equipment Co. Ltd. Montreal, Canada

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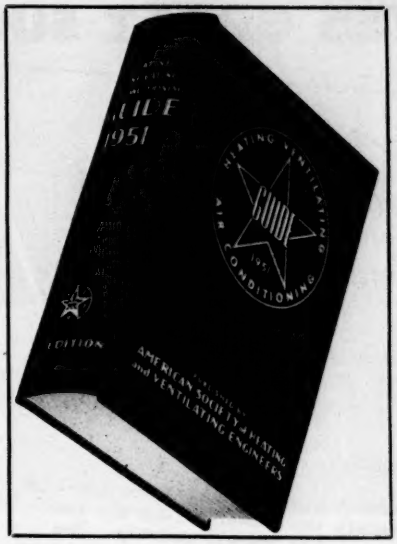

YES . . .

you need this new, completely revised, up-to-date 29th Edition of the HEATING VENTILATING AIR CONDITIONING GUIDE. You need it now because of the many special features, improvements and revisions which have been included.

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you should order the new 1951 Edition of THE GUIDE because it has 50 chapters of Technical Data—1048 pages—24 pages more than previous Editions—plus Catalog Data on products of 263 manufacturers.

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- ..... **the latest information on design of panel heating systems**
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- ..... **the newest ASA symbols for use on drawings of heating, ventilating, air conditioning equipment**
- ..... **general information on 50 subjects selected as most important in the heating, ventilating, air conditioning field**

Anyone of these may well be worth the cost of THE GUIDE to you

TYPICAL SECTIONS

AIR CONTAMINANTS—Shows latest acceptable limits for toxic gases. AIR DISTRIBUTION—Illustrates methods of obtaining proper air flow and distribution. Formulas for air flow and charts for graphical solution of problems. AIR DUCT DESIGN—Air friction charts for two ranges based on recent studies of ASHVE Research Laboratory. Method of correcting for pipe roughness given. Formulas and tables for circular equivalents and rectangular ducts. CODES—Convenient reference to 133 Codes and Standards giving source. COOLING LOAD—Design data for 315 cities. Solar heat gain tables for glass and glass block derived from ASHVE research. Simplified method of calculating heat gain through walls and roofs. DRYING SYSTEMS—Theory of drying explained. Typical dryers illustrated. Methods of drying described. FLUID FLOW—Basic theory of fluid flow through pipe, nozzles and orifices, presented clearly and concisely. FUELS COMBUSTION AND EQUIPMENT—Describes properties of various fuels and methods of burning. Gives formulas and methods for computing combustion losses. Adjustment and operation of fuel burning equipment explained. HEAT LOSS CALCULATIONS — Includes basic formulas and extensive tables for determining building heat loss for typical construction. Data on soil conductivity included. INSTRUMENTS—Outlines methods of measurement and instruments used in heating, ventilating and air conditioning. OWNING AND OPERATING COSTS—Shows method of establishing actual cost of air conditioning to the owner. PANEL HEATING—Simple presentation of principles and method of design. Charts simplify calculations. PHYSIOLOGICAL REACTIONS—Discusses principles and research upon which proper air conditions for human occupancy are based. Comfort chart is included. Describes effect of air conditioning in preventing and treating disease. REFRIGERATION—Simple presentation of the different refrigeration cycles, and brief treatment of most commonly used equipment arrangements and controls. New table shows factors affecting use of various heat sources and sinks. THERMODYNAMICS—Simple presentation of thermodynamics in air conditioning. Includes Tables on Properties of Moist Air from — 160F to + 200F, and water from — 160F to + 212F. New ASHVE Psychrometric Chart included. WARM AIR SYSTEMS—Design of both gravity and forced circulation systems presented in simplified form. Warm air perimeter systems described. WATER SERVICES—New values for per capita water consumption given. Method outlined for sizing piping for hot and cold water, cooling water and refrigeration.

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Enclosed is $7.50 for standard edition of Heating Ventilating Air Conditioning Guide 1951; please send me a copy. It is understood that I may return it within 10 days, if it is not satisfactory, and you will refund my money.

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Hotel Air Conditioning System
PROVES GREAT SUCCESS

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August 21, 1950

Mr. August Rust-Oppenheim, President
Anemostat Corporation of America
10 East 39th Street
New York, New York

Dear Mr. Rust-Oppenheim:

Using the new Anemostat High Pressure Induction-Type Diffusers was certainly the answer to our air conditioning needs. These units operate quietly. The volume control for modulating temperature works very well. Our guests feel more at home than ever in the comfortable, draftless environment of our hotel.

I wish to congratulate the Anemostat Corporation of America and Mr. S. O. Stevens of the Stewart Distributing Company, the Air Conditioning Contractor, on the excellence of this new type of hotel air conditioning. It was installed at low cost, with a minimum amount of construction alteration. Most importantly, the job was completed on time and without loss of room rental.

Sincerely yours,

THE KENTUCKY HOTEL

H.E.Harter

H.E.Harter, Managing Director

H. E. HARTER
Managing Director

S. O. STEVENS
Stewart Distributing Company

AC-1303

Write for further information

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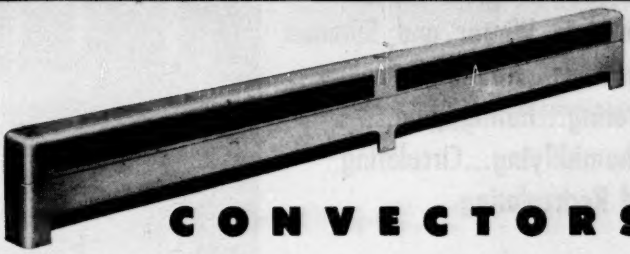
DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA, 10 EAST 39th STREET, NEW YORK 16, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

"No air conditioning system is better than its air distribution"

INSTALL YOUNG LOW-LEVEL CONVECTORS



Architects and heating contractors find the Young low-level convector-radiator line ideal for picture window installations. The streamlined, compact cabinets are just 12" high—stand inconspicuously beneath the sill, or hide away in wall recesses. The generous selection of sizes range from 20" to 112" in length, and 4", 6", and 8" in depth— meet any hot water or two-pipe steam system requirement.

What's more, you can rely upon Young ratings. These "FL" models, like the standard line, have been tested and rated in accordance with Commercial Standard CS 140-47, as developed cooperatively by the trade and national Bureau of Standards, U. S. Department of Commerce.

Young low-level models offer many distinctive design features to make specification and installation most satisfactory. The coupon, below, will rush you a copy of our new Catalog No. 4150 just off the press. You'll find it filled with helpful information.

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Heat Transfer Products for Automotive and Industrial Applications.

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Plants at Racine, Wisconsin and Mattoon, Illinois

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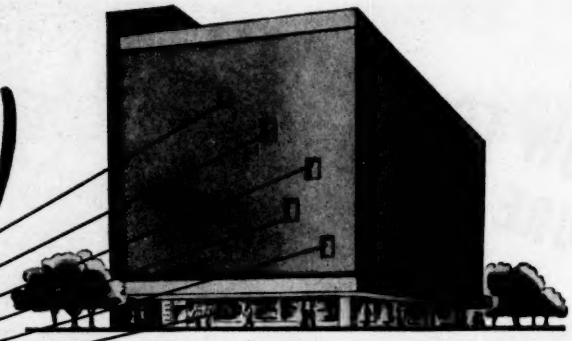
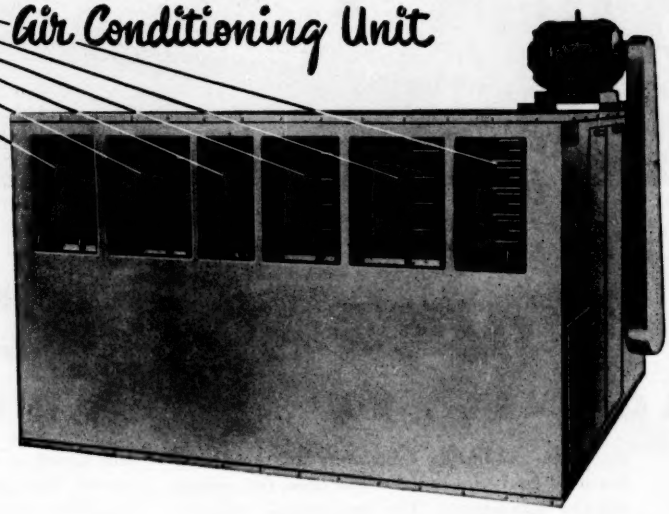


Meet 6 Different Needs at One Time with One Marlo MULTI-ZONE Air Conditioning Unit



Complete Winter and Summer Functions...Heating...Cooling... Filtering...Humidifying... Dehumidifying...Circulating and Recirculating

Where a variety of air conditioning demands must be met in a building simultaneously, new Marlo Multi-Zone Units offer these outstanding advantages:

- Each unit has its own thermostatically-controlled dampers to modulate and control the flow of warm or cold air for each zone outlet.
- Any air volume from 1500 CFM to 17,000 CFM can be proportioned to from two to six zones—for any combination of functions.
- Individual temperature control for *each zone*. (One zone can cool while another can heat).

MARLO • HEAT TRANSFER

Write for new Bulletin No. 409-MZ for information on the complete line of Marlo Multi-Zone Air Conditioning Units.

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COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS
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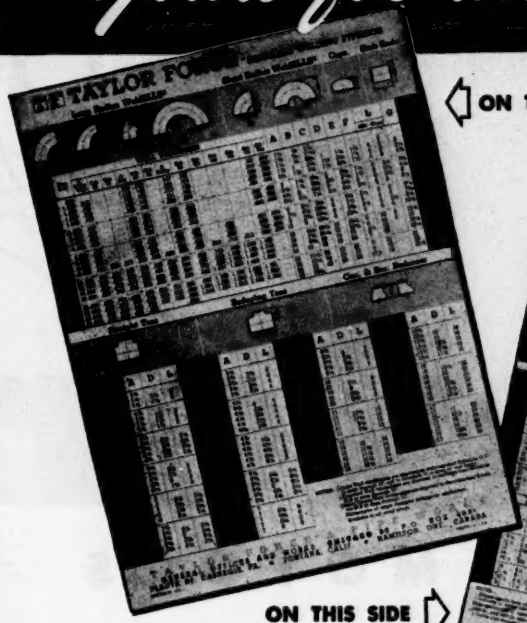
Yours for the asking—



ON THIS SIDE – Data on the WeldELL line

ON THIS SIDE – Data on Taylor Forged Steel Flanges

A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

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TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
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Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

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POSITION_____

COMPANY_____

STREET ADDRESS_____

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For the right slant on your reputation...

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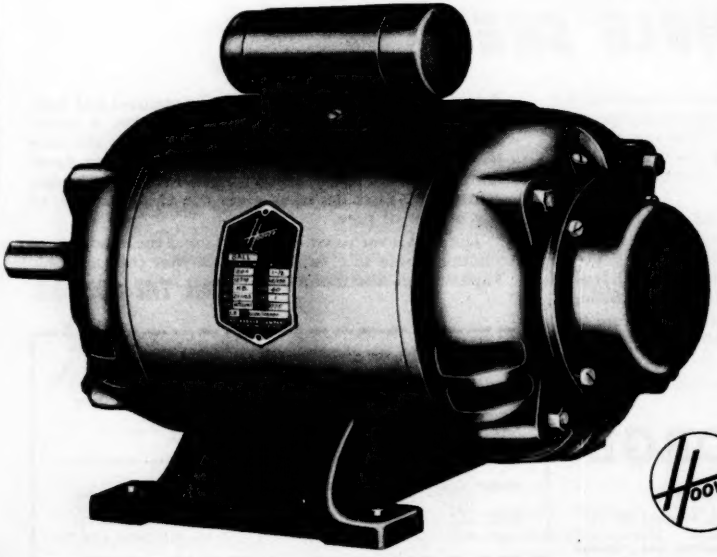
What your customers think of you depends in no small way on the performance of the products you sell. So whenever you sell or install a new motor or a replacement motor for a ventilating fan, pump, home workshop, or in fact any purpose at all, it pays to make it a *HOOVER* Motor!

Hoover general-purpose motors are famous for long, quiet, dependable service. They're built like motors costing far more. And, whatever your requirements, there's almost sure to be either a general-purpose or a special-purpose Hoover Motor to fit them—as you can see from these specifications:



1. CAPACITOR-START MOTORS for hard-starting, continuous-duty applications such as compressors, machine tools, and pumps. Rigid or resilient mounted, sleeve or ball bearings, ¼ through 1 HP. Rigid-mounted ball bearing only through 3 HP.

2. POLYPHASE MOTORS for use where three-phase supply lines are available. Start without reduced voltage compensator. Low-cost operation. Rigid mount or resilient mount, ball bearings, or sleeve bearings, ¼ through 1 HP. Rigid-mounted ball bearing only through 5 HP.

Besides these general-purpose motors, there are other Hoover Motors designed especially for pumps, oil burners, fans and blowers. Write for details.

THE HOOVER COMPANY
Kingston-Conley Division
68 Brook Avenue
North Plainfield, New Jersey

The Trane CenTraVac display as seen by thousands at the 10th International Air Conditioning Exposition at Philadelphia in January, 1951. Operating throughout the show, the CenTraVac demonstration was the main attraction of the giant 173-foot Trane booth where a total of seven new Trane heating and air conditioning products, were on display.

TRANE CenTraVac...

The Hit of the Air Conditioning Show

So quiet and free from vibration is the CenTraVac that you can hardly tell it's running. So advanced is its design that a new wide range of applications is opened up for this economical and dependable type of refrigeration. No wonder the new Trane CenTraVac—hermetic, centrifugal refrigeration unit—was the hit of the Air Conditioning Show.

Now—for the first time—these outstanding advantages are available for jobs requiring as low as 45 tons of refrigeration: hermetically sealed, direct drive design... automatic capacity control from 100% down to 10%... reduced horsepower under reduced load operation.

Simplified Installation—Without complicated controls, piping or wiring, *one* compact, lightweight machine provides a complete source of chilled water for air conditioning and process cooling applications large or small.

Low Operating Costs—CenTraVac built-in capacity control automatically adjusts the output of the unit to variations in demand of the cooling system. Horsepower per ton parallels capacity reduction over wide range of operating conditions making possible substantial savings in power consumption.

Save on Maintenance and Repair—Direct drive feature eliminates all but two main bearings in entire machine. Water cooled, hermetically sealed motor protected by failure-proof forced-feed lubrication. Nothing to go wrong, no unnecessary parts to wear out, no seasonal overhaul, no refrigerant loss when properly installed. Runs continuously season after season or can be easily shut down and started up as often as desired.

For full information on the new Trane CenTraVac, contact the nearest Trane field representative or write to The Trane Company, La Crosse, Wisconsin for Bulletin S-399.

The new Trane CenTraVac is a complete, self-contained water chilling unit. Shown here are the evaporator and condenser which are an integral part of the machine.

A brand new, all new line of Trane designed and Trane built reciprocating compressor and condensing units up to 50 tons was also introduced at the Philadelphia show.

Introduced for the first time—a new line of Trane Self-Contained Air Conditioners that occupy minimum space, and require minimum piping and electrical connections.

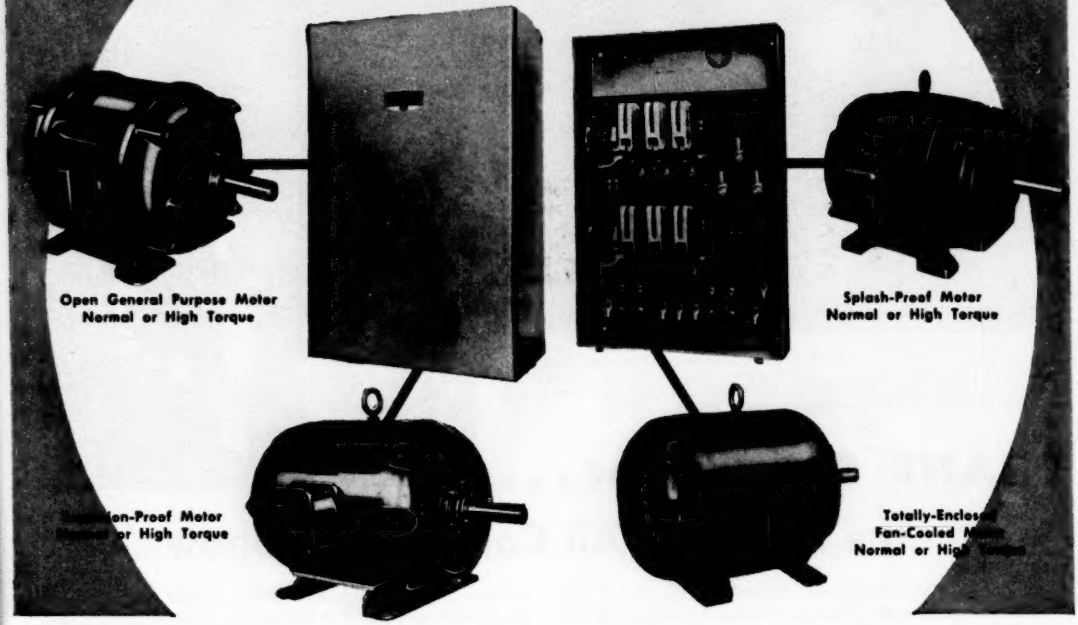
TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division, Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto
OFFICES IN 80 U.S. and 10 CANADIAN CITIES

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

Wagner
Increment Motor and Starter
...most economical for applications where reduced starting current draw is required



easy does it...

You can meet locked current restrictions by limiting the in-rush of motor current during the starting period with the low cost Wagner Increment Motor and Starter "Package". This motor and control combination is excellent for use on any application where reduced current draw at start is required.

Wagner polyphase motors, both normal and high torque, are wound with two circuits in parallel. When the increment starter is operated, its first magnetic contactor closes and puts half of the motor winding across the line, so that the motor draws only approximately 60% of its normal locked rotor current from the line. At the same time the circuit is closed to an adjustable pneumatic timer and at the completion of the timing cycle the second magnetic contactor closes, putting the second half of the winding in parallel with the first.

The Wagner Increment "Package" is economical to install, and makes possible the use of high grade magnetically operated equipment at a low purchase price.

Why not investigate this Wagner combination today? Write for full information.

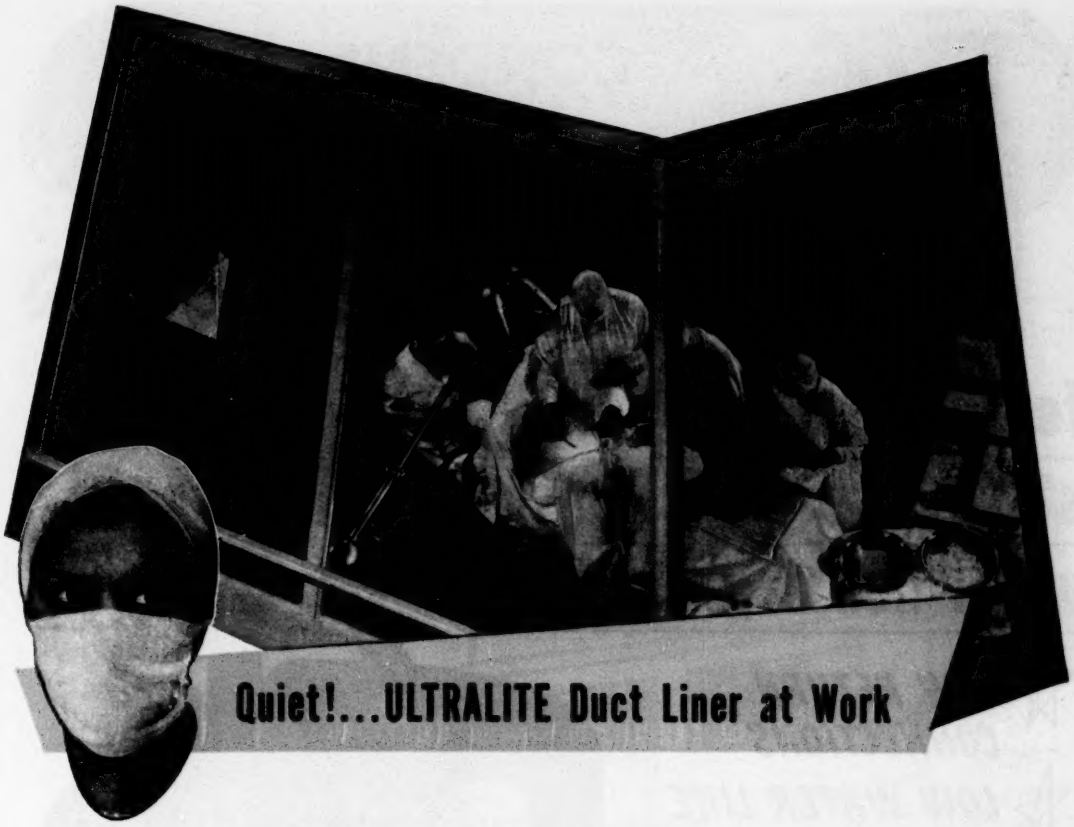
Consult the nearest of Wagner's thirty-one branch offices, in all principal cities, for expert advice on your motor application problems.

Wagner Electric Corporation
1891 WE 1951

WAGNER ELECTRIC CORPORATION
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES



Quiet!...ULTRALITE Duct Liner at Work

What a difference a few feet of Ultralite Duct Liner can make in heating and air conditioning systems! For Ultralite's long glass fibers soak up objectionable sound, reduce "fan chatter" to a w-h-i-s-p-e-r. With just a few feet of Ultralite in the plenum and supply ducts, heating and air conditioning systems can operate at peak efficiency without disturbing anyone. It costs so little to make sure "the job is right;" try Ultralite on your very next job!

ULTRALITE is the duct liner that **won't burn**—a flexible, resilient, semi-rigid glass fiber insulation designed specifically as acoustical duct liner. (It also has excellent thermal properties.) Ultralite Duct Liner won't break, flake, or chip, won't delaminate, won't flake off in air stream. You can run it quickly around curves and corners, fasten it in place with screws and washers or adhesives.

FOR WRAPPING OUTSIDE OF DUCTS, use Ultralite Duct Insulation—it's as simple as wrapping a package! Ultralite Duct Insulation is available plain or with your choice of 4 different vapor barrier facings. Use coupon for more details.

GUSTIN-BACON ULTRALITE MANUFACTURING CO.

GUSTIN-BACON MFG. CO.

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MAY-4

Please send me ULTRALITE Duct Liner and Duct Insulation samples, specifications, and catalog A.I.A. File No. 37-D-2.

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TVC CONDENSATION weil PUMPS

AVAILABLE FROM JOBBERS STOCK

for low pressure systems
steam mains-heating systems
water heater coils

- *LOW RETURN CONNECTIONS*
- *LOW WATER LINE*
- *LOW SPEED LONGER LIFE*
- *CAST IRON RECEIVER single or duplex*

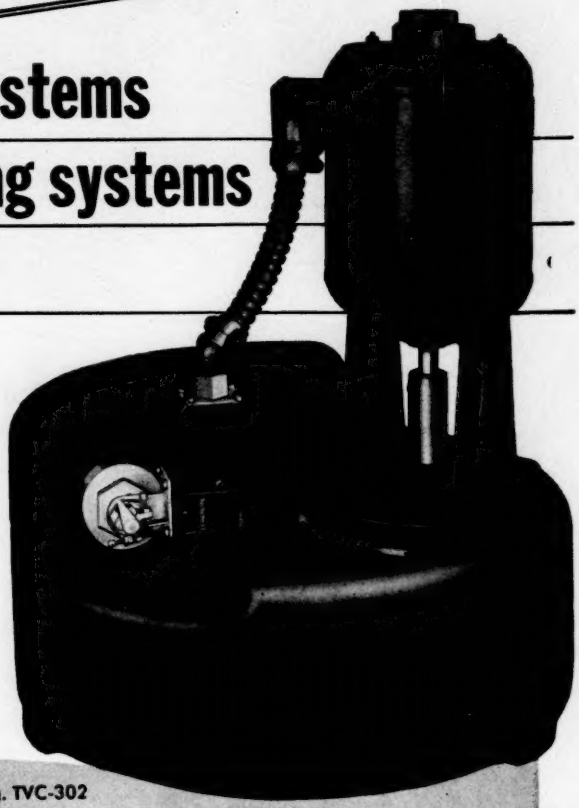


Fig. TVC-302

*TVC low return connection simplifies layout

- Permits overhead lines
- Eliminates underground lines
- Capacities 500 to 10,000 sq. ft. E.D.R.
- All Bronze Pump Head

*NRG underground condensation pumps

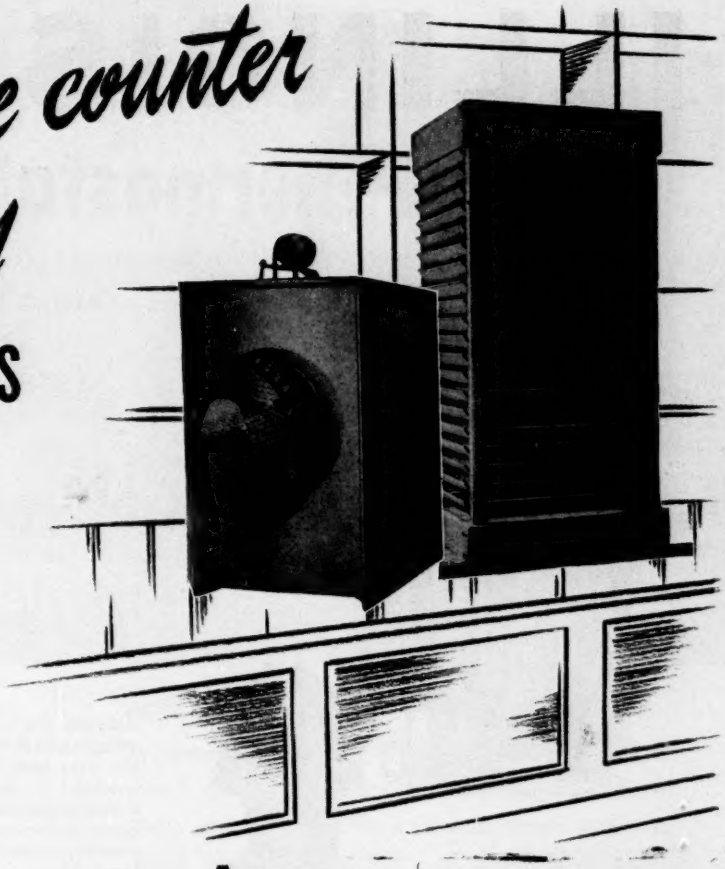
- Cast Iron Receiver
- Low Return Connections
- Installed in the ground
- Requires limited space

*WRITE FOR BULLETINS TVC-300 and NRG 200-B

weil PUMP COMPANY 1523 N. Fremont St. Chicago 22, Illinois

Over the counter delivery on

AQUATOWERS *and* SERIES 100 NATURAL DRAFT TOWERS



AVAILABILITY is a prime factor for consideration in most equipment today — so it is in water cooling towers for the multitude of three- to fifty-ton jobs this season.

Marley's anticipation of 1951 demand, however, precludes any compromise in quality . . . the finest towers are yours when and where you need them.

AQUATOWERS and SERIES 100 Natural Draft Towers *are ready* . . . in stock awaiting your orders. Service-proved in thousands of installations, these towers are accepted as the standard of the refrigeration and air-conditioning industries. Both types of towers are economical to install and to operate.

There's a size for every job . . . for new construction or for operating improvement of existing installations . . . for location indoors or outdoors.

For complete information contact your nearest Marley representative (one in every large city) or write for Bulletins AQ-50 and 100-51a.

Also Producers of

DRICOOLERS
VAIRFLO TOWERS
DOUBLE-FLOW TOWERS
INDUSTRIAL SPRAY NOZZLES

The Marley Company, Inc.

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ILLINOIS
Float & Thermostatic TRAPS

Assure lower return line temperatures

They're different!

–in construction

–in performance

ILLINOIS Float & Thermostatic Traps operate under vacuum with the same high efficiency as under pressure. No more water-logging of mains . . . no more air binding . . . end "morning overload" troubles. The instantaneous action of the condensate valve assures complete drainage of condensate. A separate thermostatically controlled valve vents air continuously in large volume, yet positively prevents loss of steam.

Recommended Applications

Low Pressure Heating Systems, Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Large Radiators or Pipe Coils, Hot Water Generators, Drips of Mains and Risers. Draining Coffee Urns, Warming Tables, Pasteurizers, Vacuum Pans, Heat Exchangers, Process Heaters, Sterilizers, Autoclaves, Cooking Kettles, Kilns and similar equipment.

(For operating ranges from 25 inches vacuum to 15 pounds pressure use Series G Traps. For pressures up to 50 pounds use Series MG.)

Rated capacities of various size traps from 200 pounds to 5000 pounds condensate per hour, at 2 pounds differential across the trap.

Positive, Instantaneous Valve Action . . . an Exclusive Feature

The Snap Action of the Condensate Control Valve assures efficient trap operation. The valve is not directly attached to float but is actuated by impact of the dropping float. Valve action is instantaneous whether the trap is handling its maximum capacity or only a trickle of condensate and regardless of variation in pressures. The valve is either wide open or tight shut—never cracked on seat, never hanging in an intermediate position. It is water-sealed at all times. It cannot chatter and is never affected by pulsations in the flow of condensate to the trap.

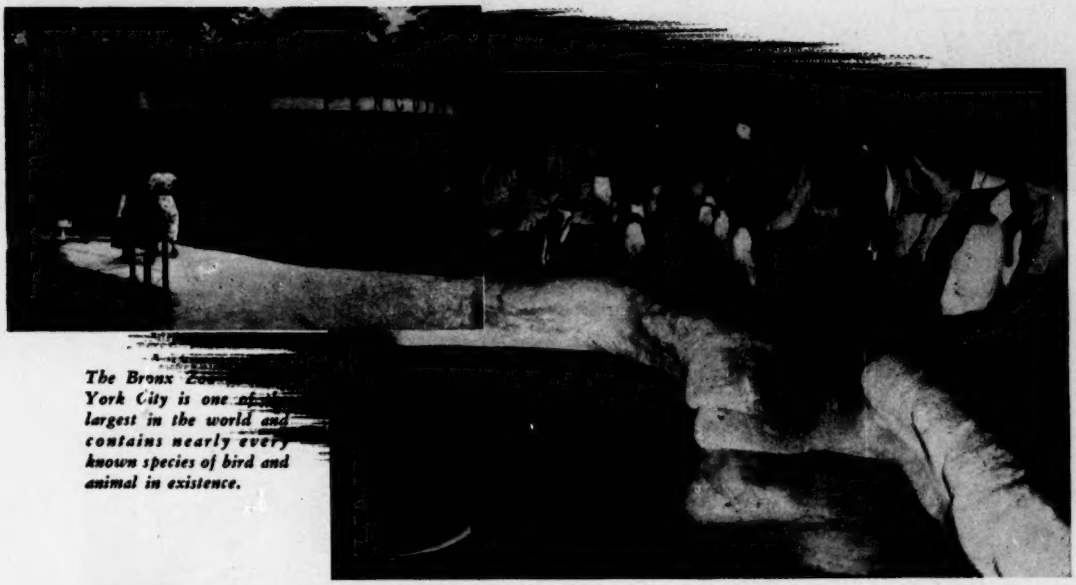
Simple, Compact, Trouble-proof

No ball floats to puncture or collapse—no toggles, pins, levers or hinges to corrode, stick or bend. Hard, stainless alloy steel renewable valves and seats are used for both condensate and air bypass units. Both valve units are at the top of trap out of dirt and sludge, assuring long life and satisfactory operation without attention. Straight through connections save head room, fittings, trenching, labor, and avoid low hung piping or lifts. Trap is easily opened for inspection without disturbing piping.

TRAP NOT DAMAGED BY FREEZING. Freezing will not harm this trap in any way and it is self-thawing.

Write for Bulletin 34-C

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8



The Bronx Zoo... York City is one of... largest in the world and... contains nearly every... known species of bird and animal in existence.

Come on in... THE WEATHER'S FINE

Bush Vertical Air Handling Unit . . . 5 to 60 tons.

Bush Comfort Conditioner . . . smart appearance, quiet operation.

Bush Horizontal Air Handling Unit . . . 5 to 60 tons.

PENGUINS ARE fussy folks who like to keep cool in Summer . . . in fact they insist on it. A Bush Horizontal type air handling unit maintains the Bronx Zoo's new Penguin House (shown above) at a year-round temperature of 50° . . . makes it no longer necessary to "store" King Penguins in a refrigerator tank during warm weather.

Here again, as in countless other applications, Bush is doing a dependable, economical job . . . the kind of job you need and demand for your requirements. Get acquainted with the Bush Representative in your territory. He's a man worth knowing.

Bush Manufacturing Co.

WEST HARTFORD • CONNECTICUT

Buy the Best—and the Best is

BUSH

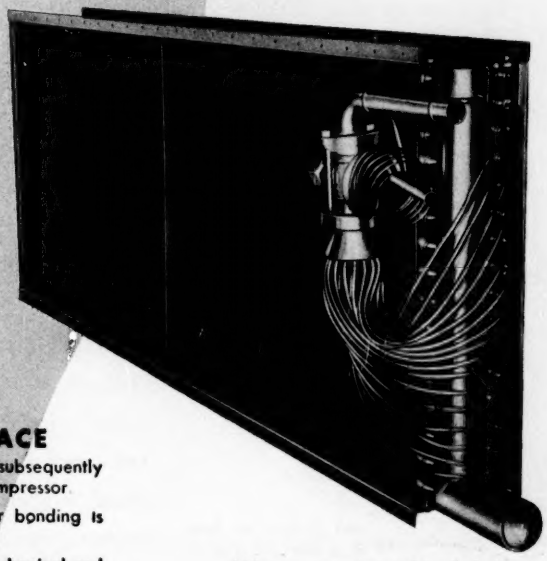
HEAT TRANSFER PRODUCTS

We can't *make* ***all*** *the*

Heat Transfer Surface

So we make the ***Best*** *of it*

ONLY KENNARD *Engineered* COILS



Give You so Much...

CLEANER INSIDE SURFACE

Hydraulic stretching loosens scale and oxides subsequently blown OUT of coil reduces danger of scoring compressor.

SAFER COIL—Having withstood 3000 psi for bonding is safe-guarded against leaks.

UNIFORM EVEN STRESS—in ALL fins—good mechanical and thermal bond.

NITROGEN ATMOSPHERE BRAZING

All header and distributor tube joints to the coil are phos-copper brazed in an inert Nitrogen Atmosphere to eliminate abrasive scale.

NO-RUST FRAMES

Frames up to 72" are ALUMINUM. Larger sizes framed in steel, hot-dipped galvanized AFTER FABRICATION.

ONE-PIECE FINS (ALL LENGTHS)

Solid plate type fin for ALL coils. Reduces air resistance. Requires less fan power. Minimizes fuzz and lint fouling.

*Underwriters Laboratories Approval**

*Does not apply to water and steam coils — not required.

We are equipped to fabricate ANY type of Heating or Cooling Coils (any refrigerant) as specified. Your inquiries are invited.

Write for Bulletins—

No. 47A—FINNED COILS

No. 486—AIR CONDITIONING BLOWER UNITS

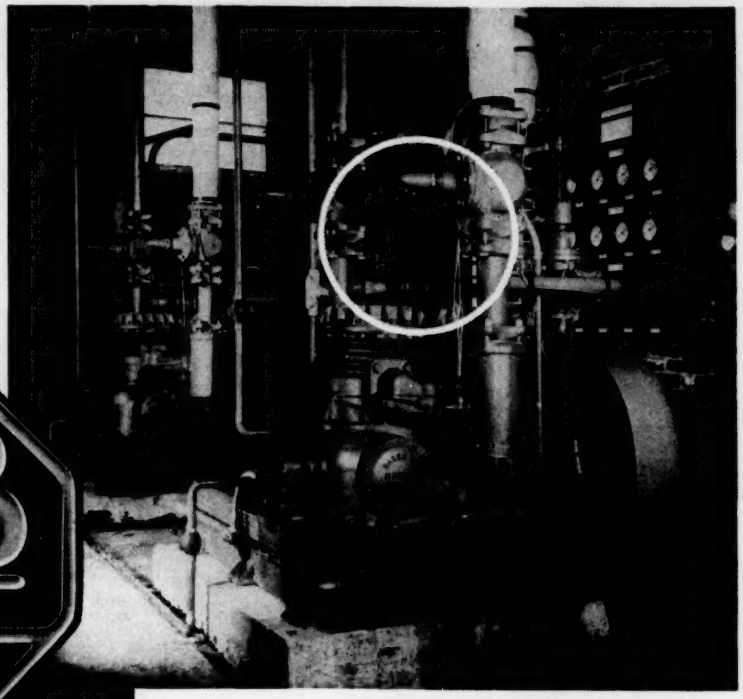
No. 491—EVAPORATIVE CONDENSERS

No. 494—COOLING TOWERS

"Refinement of Detail Marks the Difference Between Ordinary and Excellent"

KENNARD CORPORATION

Wing



Baker compressor units, equipped with Allen-Bradley motor starters, installed in Westmont Theater, Philadelphia, Pa.

A-B Quality

BAKER
COMPRESSOR UNITS
equipped with
ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

Why are Allen-Bradley starters so popular for refrigeration and air conditioning service? . . . Because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley patented silver alloy contacts never need cleaning, filing, or dressing.

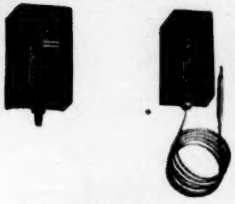
Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.

Typical Refrigeration Controls

PRESSURE AND TEMPERATURE CONTROLS



A-B Bulletin 836 pressure control and A-B Bulletin 837 temperature control. Accurate, rugged, compact units.

AUTOMATIC STARTER

A-B Bulletin 709 solenoid starter. Note white interior for ease of wiring.

COMBINATION STARTER

A-B Bulletin 712 disconnect switch type combination starter. Saves installation time.

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

QUIET, COMPACT,
UNMATCHED IN
VENTILATING EFFICIENCY
JOY
AXIVANE® FANS
...BEST in Public Buildings
The compact, vaneaxial design of JOY AXIVANE Fans offers you important advantages of quiet, more efficient operation and savings on space requirements, installation costs, and power consumption. In addition, adjustable blades—a standard JOY feature—give you easy flexibility . . . you can make a simple on-the-job adjustment to meet new or changed conditions with greatest efficiency. ● For any ventilation job, check first with JOY—world's largest manufacturer of vaneaxial fans.
Write for Bulletin, or
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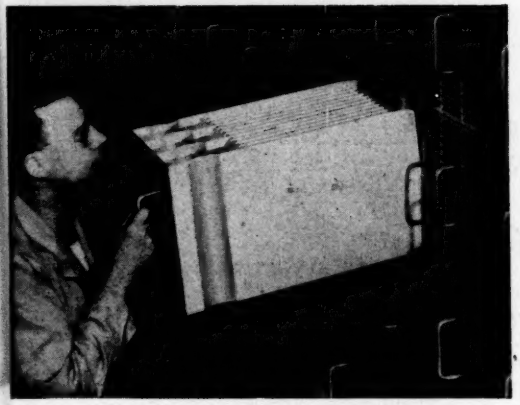
W&D I 3520
JOY MANUFACTURING COMPANY
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

FIELD REPORT

...actual quotations reporting on new Electromaze installation in Eastern Pennsylvania

CUSTOMER REPORTS: *"We are pleased with its operation, compactness and the fact that the cells can be removed for cleaning."*

CONTRACTOR REPORTS: *"It is the easiest and least expensive electric filter to install."*



EASIEST TO INSTALL! Electromaze is a new kind of electrostatic dirt precipitator made up of individual cells that slide in and out like filing cabinet drawers. Cellular steel frames come in pre-fabricated sections. All you do is bolt the sections together. Contractors report that Electromaze requires 50% less time and effort to install!

EASIEST TO CLEAN! Due to extra wide collector plate spacing in Electromaze cells, the filter can be quickly cleaned in place with a pressure hose. If manual cleaning does become necessary the cells can be readily removed for cleaning. Ask your Consulting Engineer or contact your nearby Air-Maze representative. Air-Maze Corporation, Cleveland 5, Ohio.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

CAPACITY OPERATION *Easily*

WITH THE

Sq. Ft.

OF HEATING SURFACE
PER B.H.P.
IN EVERY

SUPERIOR
STEAM GENERATOR

A good steam generator doesn't have to be pushed . . . it attains its maximum rated capacity with ease. Superior Steam Generators do just this and at thermal efficiencies in excess of 80% under field operating conditions. One of the main factors contributing to their full capacity operation at high efficiencies is the five square feet of heating surface per b.h.p. in every Superior Steam Generator.

High efficiencies developed on the job result in lower fuel costs. These same high efficiencies developed easily without pushing the steam generator result in lower maintenance costs and longer boiler life. The final result of course, is lower steam costs.

There are other features which contribute to the outstanding performance of Superior Steam Generators . . . multiple-fan induced down-draft which is built-in, combined with Superior 4-pass construction for higher efficiency . . . large evaporating surface for quick steaming . . . large steam space and dry pan to assure ample reserve steam capacity and 99.5% dry steam at the nozzle . . . and many other important features, each painstakingly developed through experience and research, to make a Superior Steam Generator the unit to cut your steam costs.

Superior Steam Generators are completely factory assembled, backed by undivided responsibility. Burn gas or oil, or both. Manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water.

Write today for the details in Catalog 319.

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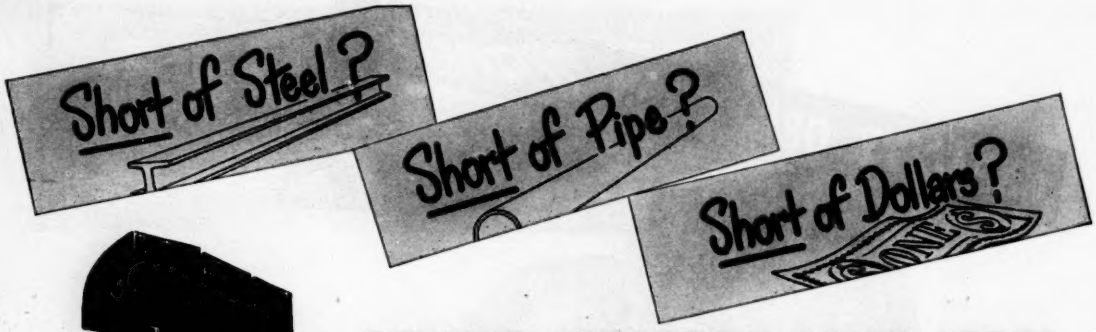


DRAVO HEATERS SAVE STEEL,

MONEY—FUEL—and MAN HOURS

The steel needed for a heating system *can* be slashed from 50% to 70% for the representative open-space industrial structure shown below . . . by using the direct-fired warm air heating method with Dravo "Counterflo" Heaters! This conservation of steel, vitally important today, adds another saving to the long list of economies in money, fuel and labor effected by this heating method.

The chart below gives the detailed comparative story. Every system is equivalent in Btu output. Steel requirements for the 13 methods have been carefully and conservatively calculated.

You will see that Dravo Heaters not only take LESS steel in each fuel classification . . . but that the HIGHEST steel requirement in a Dravo installation is *almost 50% less* than the LOWEST steel requirement in *any other* system!

Look at the contrast in *pipe* required! Jobs now held up by slow pipe deliveries can MOVE . . . if Dravo heaters are used!

Dravo "Counterflo" Heaters can expedite installation jobs for you! And the steel and pipe savings are just two of the many reasons why more and more "Counterflo" Heaters are being used in all types of structures.

DRAVO HEATERS HAVE EARNED HIGHEST INDUSTRIAL ACCEPTANCE BECAUSE THEY OFFER—

- **LOW FIRST COST . . . Users report 50% to 60% savings**
- **WORKING-ZONE WARMTH . . . Units heat 4,000 to 20,000 sq. ft.**
- **NO FUEL WORRIES . . . Burn oil or gas . . . readily converted**
- **AUTOMATICALLY CONTROLLED . . . On-off or modulating controls**
- **LOW OPERATING COST . . . 80-85% efficiency**
- **EASY INSTALLATION . . . Fuel, electric and exhaust connections only**
- **LONG LIFE—LOW MAINTENANCE . . . Stainless Steel combustion chamber**
- **TESTED—APPROVED . . . AGA and/or UL seal**
- **AVAILABLE . . . Immediate delivery, no delays**

Each heating system compared below was sized to make up a calculated 12,000,000 Btu heat loss in this representative industrial building.

WRITE TODAY FOR BULLETIN KL-526

TOTAL METAL REQUIREMENTS FOR VARIOUS HEATING SYSTEMS WITH IDENTICAL 12,000,000 Btu LOAD

COMPONENT	GAS FIRED					OIL FIRED					COAL FIRED		
	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	HIGH PRESSURE PACKAGED STEAM GENERATOR	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE PACKAGED STEAM GENERATOR	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	HIGH PRESSURE PACKAGED STEAM GENERATOR	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE PACKAGED STEAM GENERATOR	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER
BASIC HEAT GENERATORS	26,400	38,000	62,000	38,000	62,000	26,400	38,000	62,000	38,000	62,000	27,450	38,000	38,000
PIPING—Oil—Steam Boiler Room—Gas	9,096	15,490	15,490	35,308	35,308	4,352	15,790	15,790	35,608	35,608		14,990	34,808
TANKS—Oil—Blow-off Condensate		3,500	1,500	1,500	1,500	13,000	16,500	14,500	14,500	14,500		3,500	1,500
UNIT HEATERS Including Traps & Starters		21,240	21,240	21,240	21,240		21,240	21,240	21,240	21,240		21,240	21,240
STACKS & BREECHING	1,200	4,000	400	4,000	400	1,200	4,000	400	4,000	400	1,200	4,000	4,000
PUMPS—Fuel Oil Auxiliary Oil—Boiler Feed		1,000	1,000	1,000	1,000	400	1,400	1,000	1,400	1,000		1,000	1,000
STOKERS & FANS—Including Dust Collectors Fuel Oil Preheaters							2,000		2,000		23,850	15,000	15,000
STRUCTURAL STEEL Boiler House Foundation Reinforcing		7,000	2,000	7,000			7,000	2,000	7,000			7,000	7,000
TONS of STEEL REQUIRED	DRAVO **18**	**45**	**52**	**54**	**61**	DRAVO **23**	**53**	**58**	**62**	**67**	DRAVO **26**	**52**	**61**

DRAVO CORPORATION

HEATING DEPARTMENT, DRAVO BUILDING, PITTSBURGH 22, PA.

Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec

SAVE CRITICAL MATERIALS

...and a good bit o' money, too!

Make DOREX AIR RECOVERY part of your air conditioning or heating installation

Every ventilation system must supply a certain amount of fresh air to maintain satisfactory air quality within the conditioned space. But air supplied from the outside must be heated or cooled, depending upon the season. Dorex Air Recovery reduces the amount of outside air required for ventilation . . . thus, substantially less heating and cooling equipment is needed, and critical materials are saved.

The thrifty Dorex C Cell is a simple device that "manufactures" *fresh* air from *used* air by passing it through activated carbon — reducing, by as much as two-thirds, the amount of outside air that has to be taken into the system.

In dollar savings, this means that every $100 invested in Dorex Air Recovery should save some $400 on original heating and cooling equipment . . . and, in operation, every $1 spent for Dorex maintenance should return a $4 saving in running costs. These are averages based on 20 years' experience and over 7,000 Dorex installations.

Let us show you in detail the dollars-and-sense value — to you and your customers — of Dorex Air Recovery. Mail the coupon today.

TRADE MARK "DOREX" REG. U. S. PAT. OFF.

DOREX

Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut

Air Diffusion • *Air Purification* • *Air Recovery*

In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-41, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

Name .....

Position .....

Company .....

Street .....

City ..... **Zone** .... **State** .....

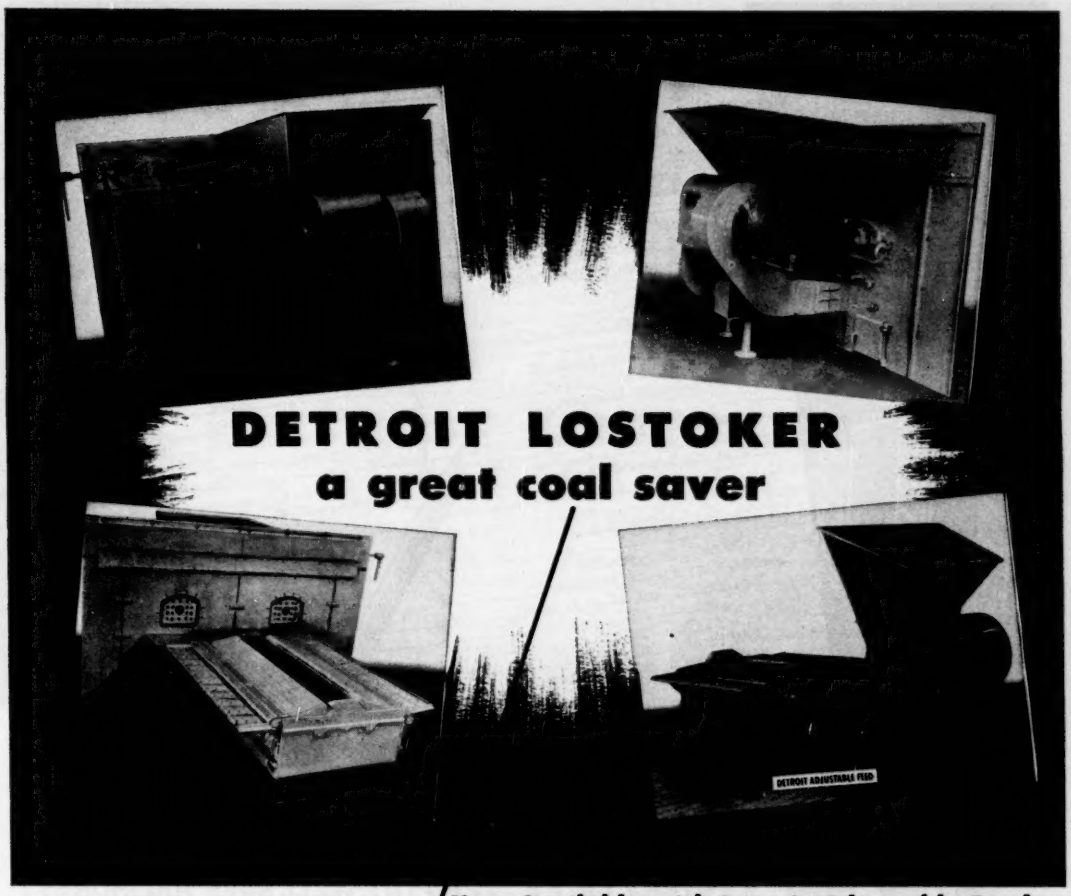
Up-to-the-minute FACTS YOU NEED *about* MARSH Heating Specialties

In this new catalog you will find 52 pages of boiled down, usable information covering Marsh Heating Specialties—equipment that has been first choice of those who insist on highest quality and efficient, trouble free performance.

It includes a section on the famous Marsh Packless Valves and renewal bonnets; sections on Marsh radiator traps, float and thermostatic traps, float traps, boiler return traps, inverted bucket traps, strainers, venting devices and related equipment. There is also a section on boiler gauges and interesting facts about the widely used Marsh-Tritrol Method of automatic control of space heating from outside temperature. Included in the pages are typical installation diagrams covering the application of Marsh valves, traps, strainers, and venting devices.

MARSH HEATING EQUIPMENT CO.
Sales affiliate of Jas. P Marsh Corporation
Dept. U, Skokie, Ill.

Write for Catalog 76-H



Now Available with Detroit Adjustable Feed

(Coal Feed Control)

The Detroit LoStoker is a complete firing unit. Compact—single retort—mechanically driven—plunger feed—side cleaning design. Many sizes and capacities for various types of boilers. Simple, accessible, dependable. Thousands in daily use.

Now the LoStoker is available with the *Detroit Adjustable Feed*, a reliable automatic coal feed control. It regulates the fuel supply according to the load when connected to a Master Regulator which also controls the air.

Coal and air are thus proportionately varied for maximum efficiency at all capacities.

The new type *Hi-Tuyeres* supply more air per square foot of grate and reduce coking tendency and decrease the combustible in the ash. Standard on all new stokers, Hi-Tuyeres are also available for present installations.

LoStokers are popular with engineers because they are dependable, easy to operate. Write for catalog. No obligation.

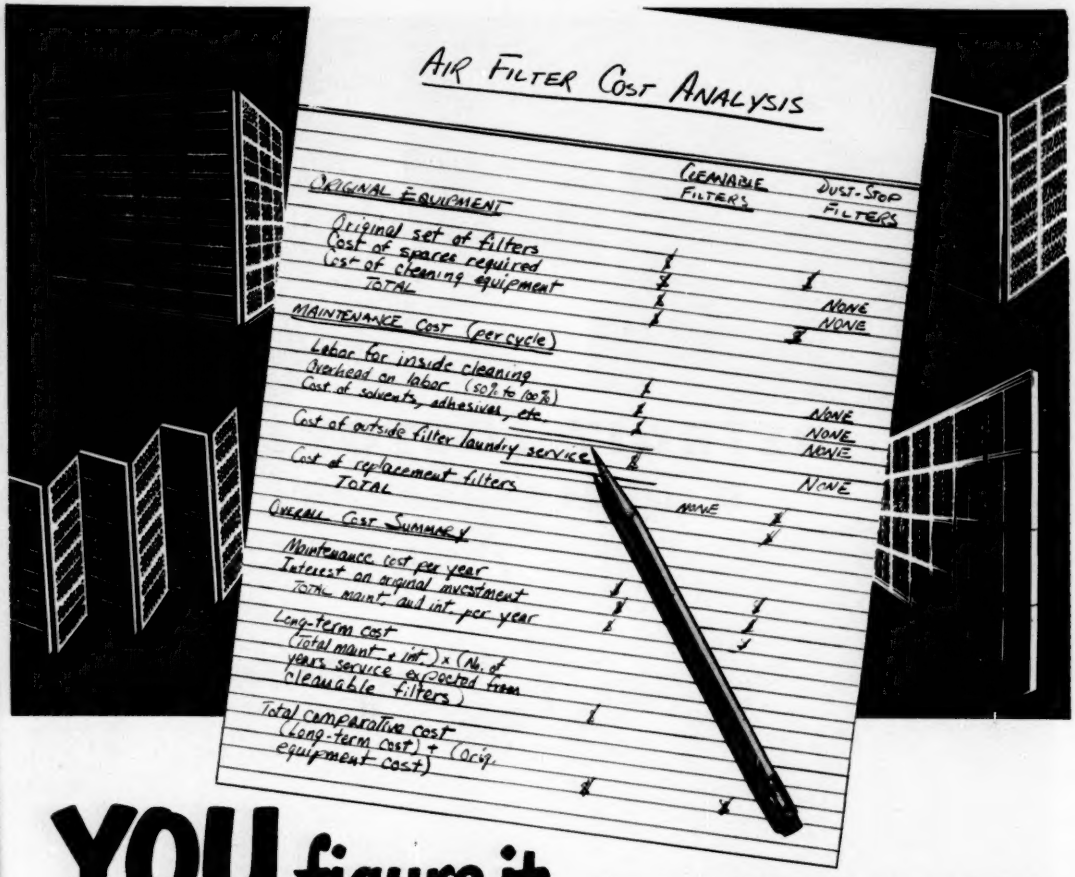
SINCE 1898

There is a Type and Size of Detroit Stoker for every Industrial and Power need!

DETROIT STOKER COMPANY

General Motors Building — Detroit 2, Michigan

District Offices in Principal Cities • Works at Monroe, Michigan



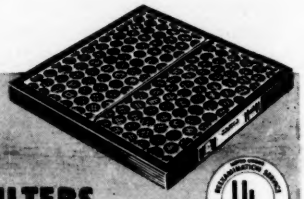
YOU figure it... (4 TO 1, WE'LL SAVE YOU MONEY)

Do you really know which costs you less—cleanable air filters or Dust-Stop replacement-type filters? It's easy to figure out, using the method shown above and *your own cost figures.* Chances are about 4 to 1 that you'll save with new Fiberglas Dust-Stop* Air Filters.

You see, while rising labor costs have made filter cleaning more expensive, mass production has lowered the cost of Dust-Stop Filters. In fact, on the basis of one 40c cleaning every 90 days, cleanable filters would have to last up to 14 years to match the cost of Dust-Stop Filters replaced at the same intervals.

Owens-Corning Fiberglas Corporation, Dept. 41-D, Toledo 1, Ohio.

The "Comparative Study of Air Filtering Costs" contains facts, figures, and charts important to anyone interested in air conditioning. A copy free on request. Write today.



OWENS-CORNING FIBERGLAS DUST STOP* AIR FILTERS

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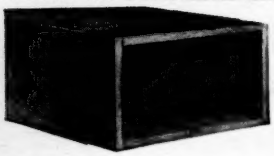


FIBERGLAS INSULATION FOR AIR DUCTS

Ageless, light in weight, firesafe, moisture resistant, Fiberglas Duct Insulations can be easily applied . . . have very high acoustical value . . . won't erode at 6,000 fpm . . . cost less than other insulations approaching them in thermal efficiency. Write for details.

*DUST-STOP is the trade-mark of Owens-Corning Fiberglas Corporation for impingement-type air filters made of glass fibers. FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibers of glass.

Washington News

LORING F. OVERMAN

WASHINGTON big-wigs who are directing the national defense program are letting it be known that they are mighty proud of three of the legs upon which the program rests, but that today's big need is for a fourth leg to give the entire activity balance.

The effort to expand facilities is progressing satisfactorily.

So is the out-turn of military end products.

Civilian production also continues at near-all-time high, despite certain cutbacks.

Lacking on the part of too many is a sense of urgency. As a result, portions of the defense program—price controls, wage stabilization and other phases demanding restraint and personal sacrifice—threaten to tip the entire structure.

Because of the somewhat limited scope of the Korean hostilities, the patriotic self-effacement that sparked the program in the days of World War II is virtually non-existent today. Too many still have the "I'll get mine, or else" attitude.

It seems that the only persons for whom this is not a "small war" are those who "get theirs" in Korea—or members of their families. To them, a 50-calibre slug is just as big in Korea as it was in North Africa, Italy, France, Normandy, Germany, Pearl Harbor, or the Pacific Islands.

Those planning the current defense program admit that they find it extremely difficult, without a sense of urgency, to make all gears of the defense machine mesh just as they should.

Men at the top—the Wilsons, the Johnstons, the Harrisons, DiSalles and others—find it extremely difficult to string along with the idea of business as usual, politics as usual, parity as usual, raises as usual, and similar "as usuals."

Forecast Recalled

To those who remember what Eric Johnston said about four years ago after returning from a tour of Russia, it seems like the handwriting on the wall to find him now heading up an Economic Stabilization Agency charged with the responsibility of keeping this country's economy on an even keel.

After interviewing Stalin and others of the Politburo in Russia, Johnston came back to tell Washington and the nation that the Red leaders expected confidently that America would experience a major depression which would make this country an easy victim of Communism without the need for armed conquest. Russia would, Johnston was informed, do all that it could to hasten the expected economic collapse.

Today, Eric Johnston occupies the one position which might enable him, if he can get the cooperation of his countrymen, put in front of Red Communism the roadblock which would prove most effective in halting the progress of their program of world conquest. If the United States can remain solvent, and at the same time build up the military might which is the one thing Communism seems to respect, Mr. Johnston will have achieved his objective.

There is no hiding the fact, however, that he is concerned. To the U. S. Chamber, to the public via radio, to labor groups, and at press conferences, he insists that inflation is an enemy far more powerful than Russia.

"We've simply got to get tough or we're heading for a national disaster," says the man who left a $125,000-a-year job, at the President's call, to take the post of Stabilization Administrator. "The trouble is that everyone believes in controls, but not for himself. Each individual—farmer, wage-earner, businessman or politician—expects the other fellow to yield to controls, but resents any attempt to place them upon his own activities.

"We must get these groups to see, if they will, that they cannot 'get theirs' without breaking the anti-inflation program all along the line. If they won't play ball, the Government must do what is essential to protect the public, even if it doesn't seem 'good politics' to do so."

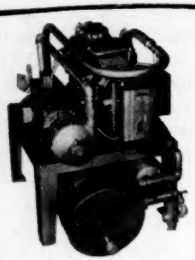
It will be interesting to see whether Mr. Johnston's evident sincerity, and his first-hand appreciation of the importance of aiming the stabilization weapon toward Moscow, will prevail against the natural tendencies of individuals of all walks of life to resist controls. It will be recalled that Alan Valentine, who occupied the ESA Director's post before Johnston, was asked to resign because he did not get tough enough. In Johnston, the Administration has a man who has a successful businessman's inherent dislike for controls, but who believes that they are a weapon necessary at this time to defeat a cunning enemy.

In urging restraint, Mr. Johnston has not used the word "patriotism." It is to be hoped that his sincerity becomes epidemic, and that it will not be necessary to beat the drums and wave the flags in order to convince management, labor and politicians that Stalin's enigmatic smile broadens each time inflation gains a point.

Three-Year Program

Charles E. Wilson, director of the Office of Defense Mobilization, is thinking in terms of "threes" these days. His thoughts do not seem to involve three legs of a table, but he does tell newsmen of a three-pronged program, to reach its peak in 1953. Two prongs of the program are closely related, he explains. One is the defense facilities prong; the other has to do with military end products. The third prong is the civilian production program.

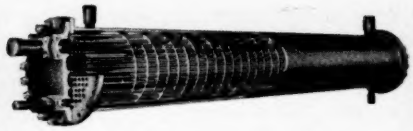
Like Mr. Johnston, Mr. Wilson says we must have "relief" if we are to avoid runaway inflation. When Mr. Wilson uses the word "relief," he is referring to relief from monetary surpluses and the factors which encourage them. He observes that, hand in hand with



FLOW-COLD* LIQUID CHILLERS

Self-contained, compact and efficient Units, furnished completely wired and with refrigerant piping completed at the Factory. For Industrial applications or for Residential uses, ACME FLOW-COLD Units are simple and easy to install and will give lowest cost, most efficient cooling. Can be used for Heat Pump application where a suitable heat source is available.

In selecting the most efficient equipment to perform a specific job of refrigeration, your task is greatly simplified when you specify "ACME" — for the ACME line is complete enough to give you a suitable ACME Product, for every kind of Residential or Industrial chilling or liquid cooling requirement. And you are certain of getting the most practical, maintenance-free, low cost operation, for ACME equipment has been preferred in the heavy Refrigeration Industry for more than 30 years.



ACME DRY-EX* CHILLERS

For brine, alcohol, water or any low viscosity fluids. There are more than 700 combinations of refrigerant heads, baffle spacings and tube lengths. The most efficient direct expansion, shell and tube units offered to the Refrigeration Industry in the last 10 years.

tailored to fit every kind of LIQUID CHILLING or WATER COOLING JOB

ACME ALSO MANUFACTURES: EVAPORATIVE CONDENSERS • FREON CONDENSERS • AMMONIA CONDENSERS • SHELL AND COIL CONDENSERS • SHELL AND TUBE CONDENSERS • FIN COILS • PIPE COILS • COOLING TOWERS • OIL SEPARATORS • LIQUID RECEIVERS • HEAT EXCHANGERS

UXR DRY-EX* WATER CHILLERS

For smaller loads, ACME has available the UX and the UXR type DRY-EX models, with both fixed and removable tube bundles. For applications involving brine, glycols, liquid sub-cooling or inter-stage condensing, consult factory for additional information and recommendations.

HI-PEAK* WATER CHILLERS

Are offered in seven standard sizes, for intermittent or continuous operation. HI-PEAK Water Coolers have large storage capacity and are galvanized after fabrication. Factory Insulation optional. Equally efficient for use with Freon or Ammonia, require a separate Compressor, as it is not a self-contained cooling unit.

ACME PRODUCTS

Acme INDUSTRIES, INC. JACKSON, MICH. U.S.A.

CONTINUOUSLY SERVING THE REFRIGERATION INDUSTRY SINCE 1919.

the three-pronged defense program, we must have relief from easy credit, from spiralling prices and wages, from climbing savings. We must have, he indicates, some means of syphoning off inflationary money pressures, lest we build inflation to a point where we will be bankrupted.

To those accustomed to think of "tax relief" in terms of lower taxes, it is somewhat of a new language to hear Mr. Wilson speak of having higher taxes offer "relief" from inflationary pressures. Nevertheless, Mr. Wilson is obviously just as sincere as Mr. Johnston in thinking that "restraint" is one of the elements which must yet be poured into the defense program.

Assuming that "relief" of the Johnston and Wilson type are forthcoming, the director of the Office of Defense Mobilization paints an optimistic picture of the defense program for the next three years. By the end of 1953, according to Mr. Wilson, the facilities expansion program will have been completed, and our military machine will be sufficiently strong to serve as a deterrent to any agressor nation or nations.

This is to be accomplished, Mr. Wilson predicts, by an expenditure of approximately $50 billion per year for military purposes—both end products and expansion—superimposed upon a civilian production only slightly less than that of 1950. By the end of 1953, according to Mr. Wilson, expansion of facilities for the production of steel, aluminum and copper, will permit the return to a civilian production of $285 billion a year, in addition to the still-large amounts that will be needed to operate and keep the military machine on a level keel.

Price a Factor

In discussing the proposed military program and the three-year goal now foreseen by defense planners, Mr. Wilson mentions the proviso that prices remain at or below present levels. The objective cannot be met, Mr. Wilson observes, if a $50 item is to cost twice as much because of inflation.

In this connection, Mr. Johnston has told newsmen that the $4 billion tax increase which the last Congress voted has already been absorbed by increases in prices of items purchased or contracted for by the military. The Administration now seeks $16.5 billion in additional taxes for military needs—based upon today's prices. It is not considered likely that taxes voted will be increased by more than $12 billion; and if prices do not hold firm, the tax increase will be meaningless.

Barring Accidents

In any event, it is somewhat reassuring to find mobilization planners thinking in terms of a three-year program, with no all-out war considered likely "barring accidents." By that the planners mean that they do not think that Russia in is a mood to start an all-out war, and that such hostilities are unlikely unless sparks should fly from some isolated area into the powder barrel and set off a major explosion. All admit this is not beyond the range of possibility, but Washington as a whole seems to agree with Stabilizer Johnston that Russia would prefer to sit on the sidelines and watch us drown in a sea of inflation caused by Red-inspired military sputterings in various parts of the globe.

Legislation Ahead

Strangely enough, although the defense program is being planned on a three-year basis, the legislation which authorizes such activity (The Defense Production Act of 1950) expires on June 30, 1951. Before that date, Congress must decide what portions of the present act are to be continued; which parts modified; which ones eliminated.

Despite the concern expressed by Mr. Wilson and Mr. Johnston, there are indications that many in Congress will not be too enthusiastic about price and wage controls. They are considering three alternatives:

1. To continue the Defense Production Act in its present form, letting the Administration answer complaints;
2. Repeal price and wage control, concentrating upon expanding production and invoking other anti-inflationary measures;
3. Renew price control with added authority for the Administration.

About the only thing that all elements within Congress agree on is that steps should be taken to head off inflation. Just where to go from there remains a mystery.

Rent Control Extended

One inflation-control activity which always seems to attract the favorable attention of Congress is rent control. Both houses have passed, and the President has signed, Senate Joint Resolution 39, which extends federal rent control until June 30, 1951. Otherwise the current program would have expired March 31, and about 2 million dwellings under ceilings would have been decontrolled.

The three-month extension bill was rushed through the Senate and House earlier in March in order to give Congress time to consider a new federal rent control program. The new rent control legislation is expected to be included in a revision of the Defense Production Act.

It is anticipated that the new rent control law will seek power to recontrol housing of all types in any area which may be designated as "critical." Indications are that this would include both transient and permanent housing accommodations, and probably commercial and office space.

To aid in determining "critical areas" the Defense Production Administration has appointed an interagency committee to designate such areas where special action may be needed to assure the construction of essential housing and other facilities for defense workers or military personnel. The first two such critical defense areas designated are Aiken, S. C., and Paducah, Ky., where Atomic Energy plants are to be constructed.

BRIEFLY STATED

• A guide to housing research activities currently is being compiled by the Building Research Advisory Board for the Housing and Home Finance Agency. The work is being financed by HHFA as part of its long-range research program.

• Proved recoverable natural gas reserves on December 31, 1950, were 185.6 trillion cubic feet, an increase of 5.2 trillion cubic feet over estimated reserves of 180.4 trillion cubic feet a year earlier, according to estimates shown today in a joint report of the Committee on Reserves of the American Gas Association and the American Petroleum Institute. These reserves are the highest on record and the gain over a year ago was registered over a record production of 6.89 trillion cubic feet of natural gas during 1950. In 1949, production of natural gas was 6.24 trillion cubic feet.

• Graduate students and faculty members from five California universities and engineers from San Francisco Bay Area firms will meet at Stanford University June 20 to 22 for the fourth annual heat transfer and fluid mechanics institute. Eighteen papers will be presented at the Institute, which will consider problems of thermal radiation, conduction, convection, mass transfer and combustion, ideal compressible and incompressible flow of gases and liquids, and various aspects of pipe, channel and boundary layer flow.

• A simple, inexpensive process for decontaminating liquids—part of the problem of waste disposal in laboratories using radioactive materials—has been developed by scientists R. A. Lauderdale, Jr., and A. H. Emmons at the Oak Ridge National Laboratory. In the process, liquid contaminated by nuclear fission products or other radioisotopes is passed through a column or series of columns containing a filter arrangement of steel wool, clay, activated carbon, an anion exchange and a cation exchange resin.

• The Ilg Electric Ventilating Co. has announced five appointments in the engineering department. Richard I. Hanford has been named head of the department. Other appointments include L. E. Peterson, head of the research division; Elmo Larson, in charge of the electrical division; Fred E. Drechsel, in charge of the design division; and James O. O'Brien, head of the information division. Mr. Hanford joined the Ilg Company in 1914 as a draftsman. He later was in charge of the electrical engineering division, working on motor design. He has helped design every motor built by the company.

• Walter Schlichting of Young Radiator Co., Racine, Wisconsin, was elected president of the Convector Manufacturers Association at a recent meeting of the Association in the Leland Hotel, Detroit. W. R. McMahon of Modine Manufacturing Co., also in Racine, was named secretary of the group. Mr. McMahon is a former president of the association.

• Automatic retirement of Edward D. Quirke as advertising manager of the Kewanee Boiler Corp. in line with company policy for length of service, and the appointment of C. Keith Ferguson as his successor, has been announced. Mr. Quirke has been advertising manager of the Kewanee Boiler Corp. 27 years, and has been associated with Kewanee manufacturing companies for 40 years. Mr. Ferguson is a native of McKeesport, Pa. He is a graduate of Duquesne University, Pittsburgh, Pa., and served four years and 11 months with the British Royal Air Force and the U. S. Air Force. He was discharged in September, 1945. In 1946, he took a position as advertising manager of the Keystone Plumbing and Heating Company at Pittsburgh. In 1948, he became employed in the advertising department of the American Radiator and Standard Sanitary Corporation, parent company of the Kewanee Boiler Corporation. In September 1949, Mr. Ferguson was named assistant advertising manager of the Kewanee Boiler Corporation.

• J. A. Hughes has been elected a vice president of Affiliated Gas Equipment, Inc., and appointed general manager of the Bryant Heater Division which operates plants in Cleveland, Indianapolis and Tyler, Texas.

• Paul K. Addams has been appointed by the National Production Administration as a member of the Advisory Committee of the Steel Boiler Industry. Mr. Addams is president of Fitzgibbons Boiler Company, Inc.

• Appointment of I. W. Cotton, president of the I. W. Cotton Company, Inc., of Indianapolis, Ind., as chairman of the Committee on Research of The American Society of Heating and Ventilating Engineers for 1951 has been announced by Lauren E. Seeley, president of ASHVE.

• New president of the Propeller Fan Manufacturers' Association is Parker T. Finch, sales manager of Hunter Fan and Ventilating Co., Memphis, Tenn. Vice president for the ensuing year is B. G. Krause, manager, Air Controls, Inc., Cleveland, Ohio. L. O. Monroe, Detroit, Michigan, was re-elected as secretary and treasurer.

• Rodney F. Lauer, one of America's pioneers in the development of high altitude chambers and all-weather rooms for the Armed Forces, has been named vice president in charge of engineering and research by York Corporation of York, Pa. Mr. Lauer, who has been with the air conditioning and refrigeration firm since he received his degree in Mechanical Engineering at Cornell University in 1930, had been managing York's Pacific District since 1944.

• The availability to science and industry of an ultimate standard of length was announced recently by the National Bureau of Standards and the Atomic Energy Commission. The standards consist of spectroscopic lamps containing a single pure isotope of mercury. These lamps enable any research organization that has the auxiliary optical equipment to have for the first time an ultimate primary standard of length in its own laboratories.

Why heat TONS

OF INSULATION, MOISTURE AND OUTER WALLS DAILY ?

1000 sq. ft. of ordinary insulation when bone dry weigh 2000 lbs.
1000 sq. ft. multiple accordion aluminum weigh 46 lbs., 1 sheet, 12 lbs.
1000 sq. ft of ordinary insulation occupy 175 cu. ft.
1000' accordion multiple aluminum occupy 1⅓ cu. ft.

3000 sq. ft. of ordinary mass insulation means about 3 tons of it to heat every winter morning. If moist and heavy with condensation, there is that much more tonnage to heat, plus the fuel required to evaporate it. (It takes 1,060 Btu's at 60° F to convert 1 lb. of WATER into vapor. Only half that amount, or 530 Btu's, is needed to raise 1500 cu. ft. of AIR 20°) In addition, ordinary insulations transmit heat to outer walls by direct conduction through solids.

Most building materials, including mass insulations if air-spaced to reduce direct conduction through solids, ABSORB over 90% radiant heat on one surface, and emit 90% on the other surface. *Multiple sheets of accordion aluminum THROW BACK the heat inside the building in winter, outside in summer.* (They REFLECT 97% of heat rays, emit but 3% on the opposite side, block convection, and allow but 5% heat loss by conduction through their air spaces which have negligible density)

NO CONDENSATION CAN FORM

In winter (with multiple accordion aluminum sheets) there is little heat loss or expense in heating 3000 sq ft. of the one aluminum sheet in contact with the warm air. It weighs less than 40 lbs (1/100 lb. per sq ft.), immediately assumes almost the same temperature as the contiguous warm air, and so is *non-condensation forming* Its zero permeability prevents any passage of vapor.

The outer aluminum, which also weighs less than 1/100 lb. per sq. ft., is about the same temperature as the contiguous cold air, (slightly warmer in fact) and so is *also non-condensation forming* Since heat flow in conduction and radiation is from warm to cold, no heat is extracted from the air (the reverse in fact). Therefore the capacity of the air to retain vapor without condensing is not reduced (in fact, increased).

THERE IS NO DEW-POINT

Between the 2 external aluminum sheets are 4 protective, reflective air spaces; *without a dew-point* anywhere on or within the insulation.

The commercial form of multiple sheets of accordion aluminum is Infra Insulation Type 6. For additional information about heat and vapor, consult the U. S. Government booklet *"Insulation and Weatherproofing,"* or Infra's *"Simplified Physics of Vapor and Thermal Insulation."* Either or both sent free by Infra. Use the coupon

THERMAL FACTORS, TYPE 6

Down-Heat C.044 R22.72 equals 7½" DRY Rockwool
Up-Heat C.08 R12.50 equals 4" DRY Rockwool
Wall-Heat C.073 R13.69 equals 4½" DRY Rockwool

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We doubt that you've worked on many birdhouses lately.

We haven't helped heat any, either.

But we can help heating engineers and contractors provide the proper thermal environment for any client—anywhere—in any kind of structure.

We have a lot of literature on the automatic control of all phases of heating, ventilating and air conditioning. Information you should have in your files.

And we have a lot of very well informed control engineers—in our 89 different offices—who have a lot *more* information right at their finger tips.

We sincerely believe we can help you on any project that poses problems of control of any kind—for *control* is Honeywell's business.

So, why not *talk to Honeywell?* Why not *write* to Honeywell for complete information on the equipment discussed in the column across the page? And why not do it *now?*

MINNEAPOLIS
Honeywell
First in Controls

• A bronze plaque "in recognition of 25 years of loyal service" has been presented to Aubry V. Hutchinson, executive secretary of The American Society of Heating and Ventilating Engineers, by the ASHVE. The presentation was made by Lauren E. Seeley, ASHVE president, who is dean of the College of Technology, University of New Hampshire.

• Results of extensive laboratory testing of the properties of 50 materials for protecting surfaces from radioactive contamination have been made available, with the declassification of a report of the Oak Ridge National Laboratory. The study was undertaken when experience showed that structural materials used in standard chemical laboratories were not always applicable to radio-chemical laboratories, and little user-history on other potentially applicable materials was available. Tests produced recommendations for use and the conclusion that "strippable coatings of the vinyl-base type are generally useful and inexpensive . . . perhaps the best means of protecting wall and ceiling surfaces from contamination." Copies of the report (AECD 2996) will be sold through the Office of Technical Services, Dept. of Commerce, Washington 25, D. C.

• Directors of Iron Fireman Manufacturing Company have elected William J. O'Neil chairman of the board and chief executive officer of the company. Mr. O'Neil has managed the company's Chicago operations for the past 15 years. Frank S. Hecox will continue as vice president and treasurer.

• A. Wilson Knecht has been admitted to the firm of Seelye, Stevenson & Value, civil, industrial and structural consulting engineers, with offices at 101 Park Avenue, New York 17, N. Y. The firm will be known as Seelye, Stevenson, Value & Knecht, Consulting Engineers. Mr. Knecht has been chief mechanical engineer and assistant chief engineer for Walter Kidde Constructors, Inc.; and was formerly an associate of Clyde R. Place.

• Paul B. Baird of Youngstown has been advanced to manager of standard pipe sales for The Youngstown Sheet and Tube Co. He succeeds Glenn W. Christopher, who died recently.

• In what is believed to be the largest single sale of room air conditioners on record to an end-purchaser, 560 one-horsepower Carrier units were purchased for the Baker Hotel of Mineral Wells, Texas, and the Gunter Hotel of San Antonio, Texas.

• F. J. Van Poppelen has been named general manager of the General Electric Company's air conditioning department with headquarters at Bloomfield, N. J. Mr. Van Poppelen has been assistant general manager of the department since the first of the year and had previously been manager of manufacturing.

• R. H. Israel, President of the Refrigeration Equipment Manufacturers Association, has announced that the month of April has been designated as National Refrigeration Safety Month.

We can't help you heat birdhouses, but we can help you plan better control for your heating systems. So fill out the coupon below and send it to us for

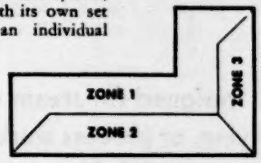
Facts you need—FREE!

Honeywell Electronic Moduflow can give your customers the finest automatic temperature control available. In this system, the smallest change in temperature indoors—or outside the house—activates sensing elements which signal the Electronic Relay Amplifier. The amplifier "interprets" the signals—and controls the heating plant with split-second precision. That's why Honeywell Electronic Moduflow provides the owner with uniform comfort—even in the most changeable weather.

A highly adaptable system, Electronic Moduflow is superior to all other home temperature control systems for these two reasons: *1. All sensing elements are electronic—which means they're up to 100 times more sensitive than mechanical controls. 2. Units of the systems compensate for all three important control factors—temperature changes outdoors, load shifts indoors and structural heat loss.*

Honeywell Zone Control is an excellent way to achieve uniform comfort and economy in *any* type of structure. Tailor-made systems are available for homes—and for institutional, commercial and industrial buildings.

In the Honeywell Zone Control System, each zone is equipped with its own set of controls, including an individual thermostat. This means you can maintain the desired temperature in every part of the structure despite wide differences in exposure, use, occupancy and structural heat losses.



And Zone Control makes it possible to lower temperatures for economy's sake during the part of the day when certain sections of the building are not in use.

For additional, specific information on Honeywell Electronic Moduflow and Honeywell Zone Control, fill in and mail the accompanying coupon now. It will bring you material you'll want to read—and keep handy in your files.

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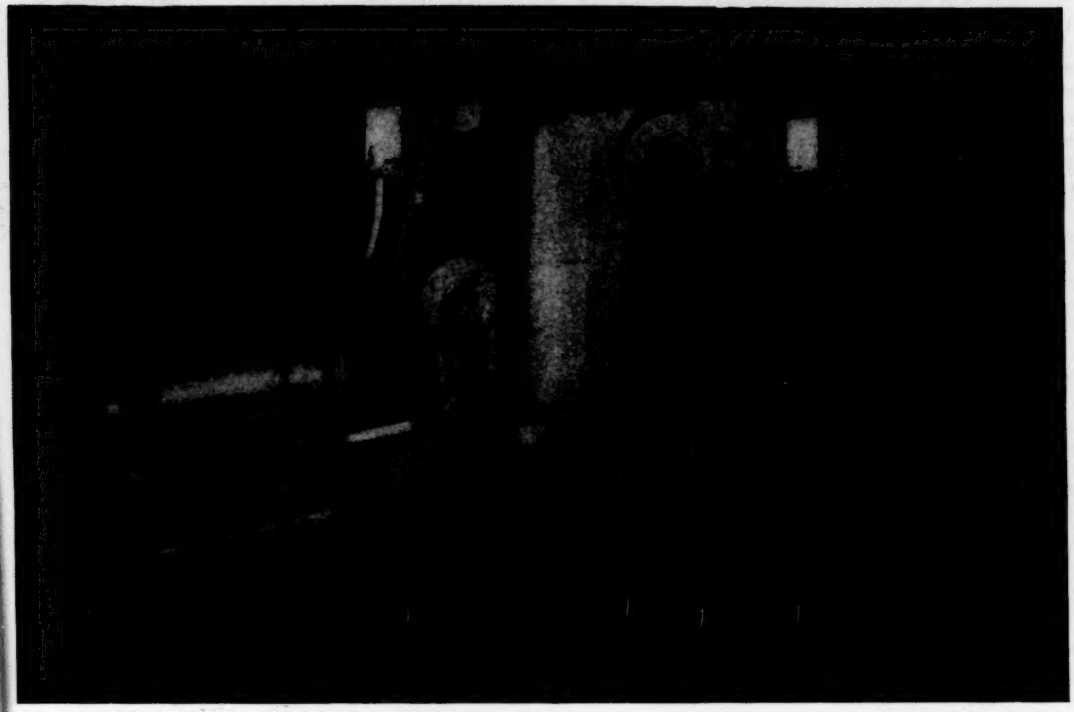

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Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

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A Venturi Scrubber for Cleaning Industrial Gases

W. P. JONES
Chemical Construction Corp., New York, N. Y.

A recent development is the Pease-Anthony Venturi gas scrubber which consists of a Venturi passage with an arrangement of water jets around the throat such that gases at high velocity atomize a curtain of liquid into a fine mist which subsequently coalesces as velocity is reduced. This article describes the principle and applications of the Venturi scrubber. Performance data and particle size information are included.

IN the Venturi scrubber, the initial velocity differential between gas-borne solids and the scrubbing liquid is very high, several hundred feet per second. The scrubbing liquid is introduced into, or just ahead of, a Venturi throat, as shown in Fig. 1. The circle of jets under low pressure (5 to 15 lb per square inch) creates a curtain of liquid across the throat. The gas to be cleaned collides at high velocity with the curtain of liquid which is thereby violently accelerated and disrupted. As the gas decelerates in the diverging section of the Venturi, the wetted particulate matter suspended in the finely dispersed droplets coalesces downstream, and the resulting droplets of liquid are large enough to be separated from the gas by a centrifugal separator. In this separator the solid-bearing liquid is diverted and is piped off to a settling tank while the cleaned gas proceeds on out the top of the separator.

The atomizing effect of the high velocity gas as it enters the throat of the Venturi and disperses the

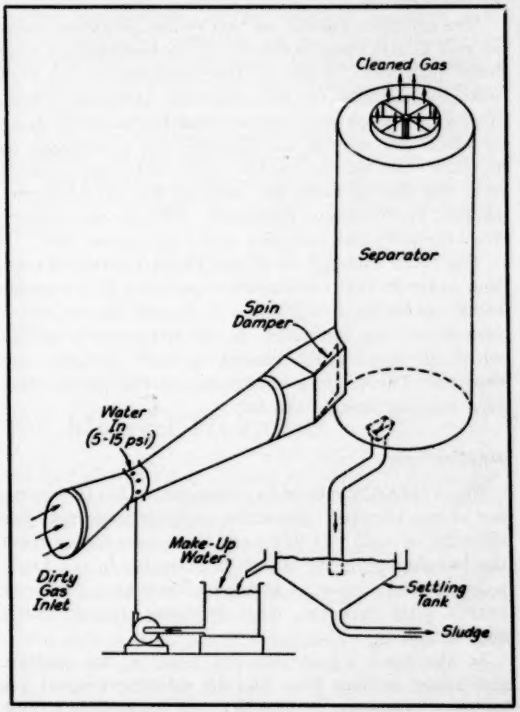

Fig. 1. Schematic diagram of the Venturi Scrubber.

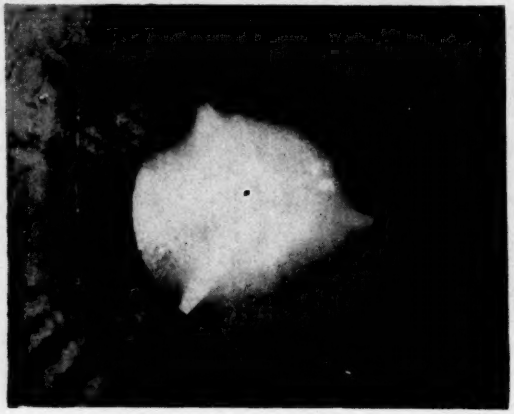

Fig. 2. Looking downstream into Venturi throat with water entering at 17 fps and gas traveling at 92 fps.

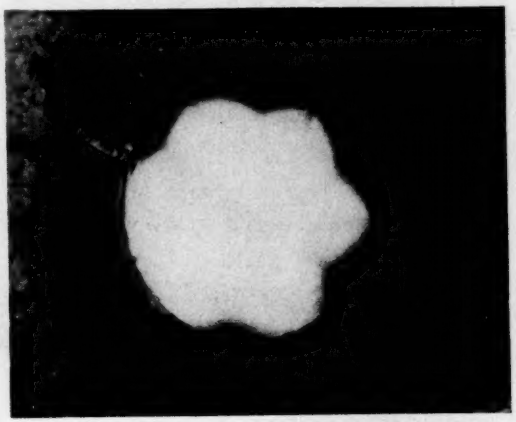

Fig. 3. Same conditions as Fig. 2, except gas velocity is 232 fps; sufficient to atomize liquid and cover throat.

scrubbing liquid is shown in Fig. 2 and 3. Fig. 2 is a view looking downstream into a Venturi throat 5⅜ inches in diameter. The water enters the throat as solid streams from jet nozzles at 17 fps, while the air velocity is about 92fps. The gases have a relatively low velocity, most of the droplets are relatively large and the paths are fairly straight. In Fig. 3 conditions are the same except that the gas velocity is 232 fps. Here the scrubbing liquid is quickly atomized and dispersed to give complete coverage in the throat of the Venturi.

The complete answer as to why the scrubber works so well is still open to debate. Four mechanisms have been suggested. First, is the impingement of high velocity particles on the relatively stationary fluid. This explanation could be accepted for particles down to about .25 micron but becomes less convincing as particle sizes become smaller. A second explanation is that the fine particles are collected by diffusion, molecular, or Brownian movement. This is satisfactory for extremely fine particles of 0.1 micron or less.

The third explanation of the Venturi scrubber's action suggests that condensation may be a factor under some operating conditions. A fourth factor which may enter into the action is the electrostatic charge which is undoubtedly present in both particles and droplets. The relative importance of the various factors has not been evaluated.

Applications

The Venturi scrubber has been successful in a number of gas cleaning operations, including furnaces for recovery of sodium sulfate and carbonate fumes from the burning of concentrated black liquor in the kraft pulp process. Other applications have been for open hearth steel furnaces, blast furnaces, rotary driers and others.

In the black liquor recovery furnace, the particle size range is from less than 0.1 micron to about 1.5 micron. Operating conditions are very steady, and delays characteristic of some batch processes are not encountered. The average weight efficiency of removal was 90% during test runs. The headpiece of this article is a photograph of this installation, and Fig. 4 shows the arrangement of liquid jets at the throat of the Venturi. The recovered chemicals have considerable value and are readily returned to the process.

Pilot work has been done on these fumes, using the thick concentrated black liquor as the scrubbing medium. When this is done, water is evaporated while fumes are being collected, and a better over-all economy results.

Fig. 5 shows the arrangement of jets on a Venturi scrubber used on the effluent from an open hearth steel furnace in which oxygen is injected to speed up the reactions in the furnace. Prior to application of the scrubber, a brick-red cloud had issued from the stack and persisted as a real nuisance for miles for several hours during each heat. When the Venturi was turned on, control of the red cloud was spectacular and very high efficiencies were realized both by eye and on the usual weight percentage basis. The average weight efficiency was 99%.

A series of test runs for the cleaning of blast furnace gas at low velocities and low water rates with pressure drop of less than 7 inches w.g. shed some light on the problems under these conditions. The dust in blast furnace gas is relatively coarse, and the weight efficiency of the scrubber was 98% or 99% with gas velocities at the throat ranging from 134 to 228 fps and a pressure drop across the Venturi ranging from 4.4 to 6.6 inches w.g. Work on finer aerosols required higher gas velocities and higher pressure drops for equivalent efficiency.

Mists and Fogs

Performance data of the Venturi scrubber in the removal of mists and fogs from effluent gases show that on a number of sulfuric acid mist problems from different sources with widely varying mist loadings, weight efficiencies were from 97.5% to 99.4%. There was no noticeable drop in removal efficiency when

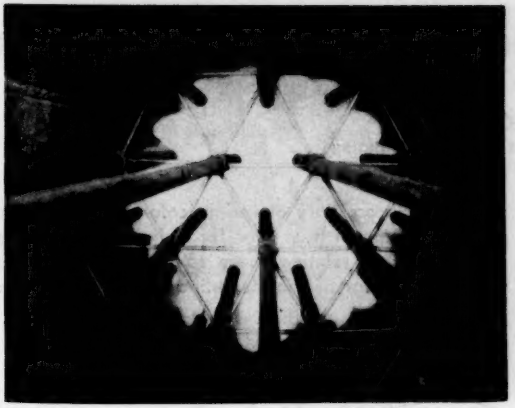

Fig. 4. Arrangement of jets at Venturi throat in a kraft pulp process.

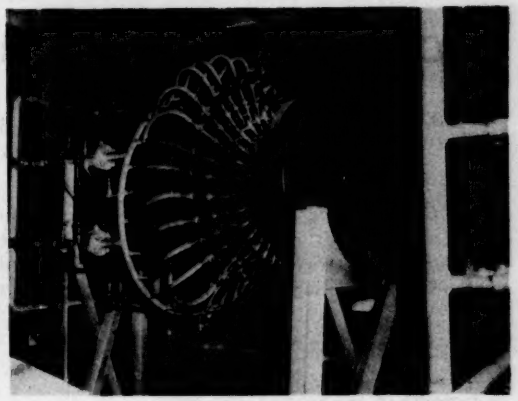

Fig. 5. Arrangement of jets at Venturi throat in an open hearth steel process.

scrubbing with recirculated acid up to 40% strength.

In an application for the spray drying of fatty material, the effluent gas contained odorous substance which was initially in the gas phase in the spray drying tower but condensed to a bluish thin smoke with particle size probably below .25 micron. This fume is unstable and finally evaporates to a gas which has a characteristic odor. The scrubbing liquid used in the jets was recirculated water plus a weak alkali and absorbed from 80% to 85% of the material.

Most of the pilot work has been done with a Venturi scrubber discharging into a cyclonic spray scrubber, the spray nozzles of which can be operated or not. In virtually every case when the spray nozzles were operated in a cyclonic scrubber, some increase in efficiency was noted.

In most cases, however, the Venturi scrubber alone gave acceptable efficiencies. Where the very maximum efficiency is desired, the Venturi and cyclonic scrubbers arranged in series are effective. In a copperas roasting kiln installation, the collection of effluent sulfuric acid mist was 99.6% efficient. In this installation, the Venturi scrubber alone was 99% efficient while spray nozzles in the cyclonic scrubber were shut off.

In some cases, the scrubber has been effective in recovery of valuable chemicals which previously have been lost because of the lack of an economical means for recovery. A commercial unit has recently been installed for the recovery of absorbent monoethanolamine used in the manufacture of dry ice and will pay for itself in a few months' operation.

Other installations of the Venturi scrubber are now in successful operation on such applications as secondary lead smelters, wood distillation gas cleaning, phosphoric acid plants and phosphoric acid concentrators.

One of the particular advantages of the Venturi scrubber is its relatively low cost and simple operation. Maintenance of the scrubber is simple and can be done by the average worker without extensive training.

Radiant Heating Ideal for Mental Hospital

Heating systems in mental hospitals have been generally recognized by hospital authorities as a source of many minor, some major headaches. The possibility that irresponsible patients might burn themselves on hot surfaces, disturb heating controls, or in some way upset the operation of the heating plant is present in most systems.

With these considerations in mind, the Southeast Louisiana State Hospital, a U. S. Public Health Service project near Mandeville, La., was designed to incorporate a radiant heating system throughout the building.

Heat radiates from floor surfaces which never exceed 80F so there is no danger of burns. Controls for the system may be placed wherever convenient, locked in a cabinet if necessary.

The system used at Southeast consists of wrought iron pipe, coiled and welded, imbedded in the concrete floors of the rooms. Hot water, running through these pipes, heats the floor and, from there, the room.

The $2.5 million hospital building has one of the largest radiant heating projects in its part of the country; 19 miles of wrought iron pipe were used in the fabrication of this system, according to A. R. Salzer, Jr., mechanical engineer for the project.

Handling Sun Loads on Buildings

WM. B. FOXHALL
Associate Editor, Heating and Ventilating

Some practical aids to estimating and design handling of sun loads on buildings appear in recent literature. One article has to do with a simplified method of calculating solar angles. A second deals with the absorptivity of various colored paints. Third is a discussion of heat flow through glass. Following is a means of relating these to published solar intensity data for use in simplified design procedure.

A MEANS of plotting hourly sun angles for any location and for each month of the year (1)[1] is based on the ancient drawing of the celestial hemisphere showing stars and sun moving in changing paths around a hemisphere in which the observer is at the center. A simple means of plotting the pathway of the sun for the entire year in any latitude is demonstrated at the end of this article. An example chart for 42°N is shown in Fig. 1.

Use of Chart

The chart has a number of uses in air conditioning practice.

(1) It can predict the angle of incidence of the sun's rays (hence, instantaneous heat gain) on any surface.

(2) It can forecast the shadows of buildings or the shade of trees at any date or hour.

(3) It can determine the length of overhang of eaves to exclude sun from any window during whatever period protection is required.

The angle of incidence of the sun's rays is described as the number of degrees of deviation from the perpendicular. It is used in conjunction with solar intensity data to calculate the instantaneous rate with which heat is impinging on the surface (2). That is

$$I = I_n \cos i \qquad (1)$$

Where I = solar intensity impinging on a surface, Btu per (sq ft) (hr)

I_n = solar intensity in Btu per (sq ft) (hr) at a surface normal to the sun's rays. [Weather Bureau data are

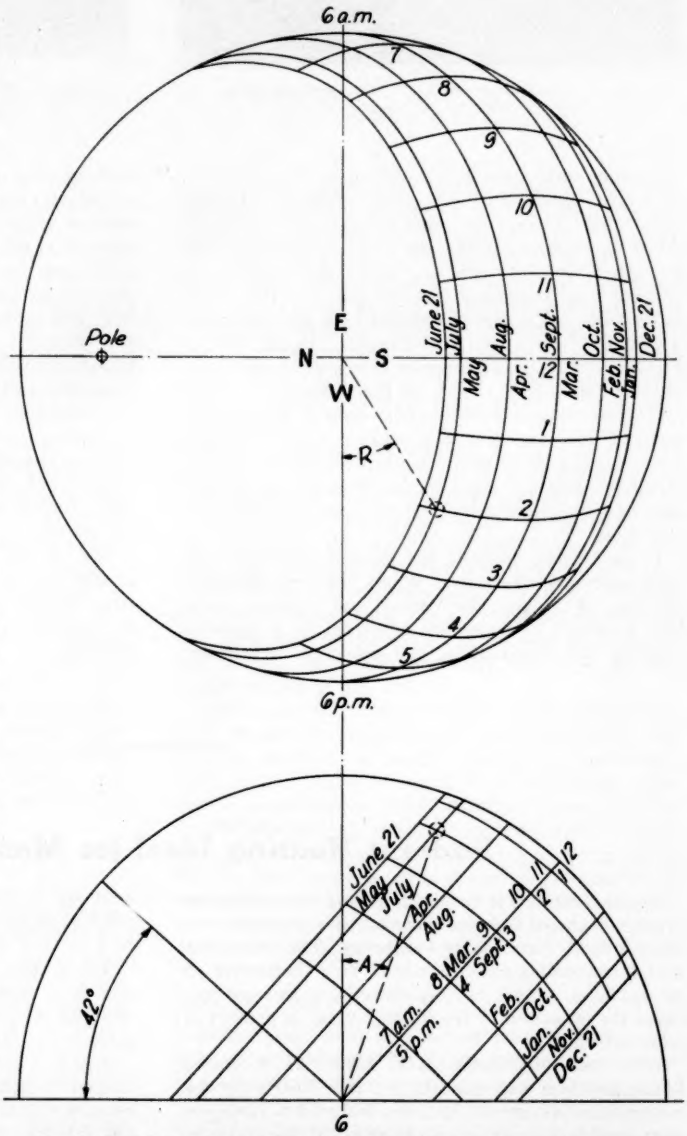

Fig. 1. Completed chart of celestial hemisphere. Dotted lines are for example in text.

[1]Numbers in parentheses indicate references except where other enumeration is obvious.

in terms of langleys per minute on a surface normal to the sun. A langley is one gram calorie per square centimeter or 3.69 Btu per sq ft. Hence, langleys per minute should be multiplied by 221.4 to give Btu per (sq ft) (hr)].

i = angle of incidence.

The angle of incidence on a horizontal surface can be read for any hour from the chart by measuring, in both plan and section of the hemisphere, the angles formed with the east-west axis by radii through the point representing the hour in question. These angles for 2 p.m. May 21 are shown in Fig. 1 and designated R and A, respectively. The angle of incidence on a horizontal surface is calculated, according to reference (3), from:

$$\tan i_h = \tan A \csc R \qquad (2)$$

For the example shown, angle A is 19.5 degrees and angle R is 32.2, thus, from standard reference tables,

$$\tan i_h = .35412 \times 1.8766 = .66454$$
$$i_h = 33^\circ\ 36'$$

A representative weekly average reading for the example hour and latitude (Blue Hill, Mass.), according to Weather Bureau data (4), is 1.0 ly per min. This is equivalent to 221.4 Btu per (hr) (sq ft) striking a surface normal to the sun.

From this, the instantaneous heat striking a horizontal surface at the example hour would be, from equation (1)

$I_h = 221.4 \times .83292 = 184.4$ Btu per (hr) (sq ft)

Note that I_n values vary with geographic factors along a given latitude (5,6) so that specific data for the region in question must be obtained.

As a source of heat gain on a space under a horizontal roof, the value of I_h would, of course, be modified by a number of factors, such as the surface finish, conductivity of the roof, indoor and outdoor temperatures, wind velocity, etc. The effects of these factors are discussed in standard references with some additional data offered later in this article in Table 1 under the heading *Paint Absorptivity* and in Table 3 under the heading *Heat Flow Through Glass*. The instantaneous heat absorbed by any surface would be

$$Q_{ab} = I\,E \qquad (3)$$

Where Q_{ab} = instantaneous heat gain at the surface, Btu per (hr) (sq ft)

E = effective absorptivity from Table 1

The instantaneous heat transmitted through glass with sun at any incident angle would be

$$Q_{tr} = I\,F \qquad (4)$$

where F is a fraction taken from Table 3.

Vertical Surfaces

The angle of incidence on a vertical surface can be determined from the chart by measuring, on the hemisphere plan, the angle between a vertical plane through the sun's position and a vertical plane through the perpendicular to the wall. This angle, x, is then used in the formula

$$\cos i_v = \sin i_h \cos x \qquad (5)$$

where

i_v = angle of incidence on vertical wall
i_h = angle of incidence on horizontal
x = as described. Where x is 90 degrees or greater, of course, no sun will fall on the wall in question.

Equations (1) and (3) can again be applied to determine instantaneous heat gain at the surface. These equations can be combined to give

$$Q_{ab} = E\,I_n \cos i \qquad (6)$$

where symbols are as previously given.

On a southwest-facing wall at the example hour the angle x would be

$$x = 45 - R = 12.8 \text{ degrees}$$

From equation (5),

$$\cos i_v = \sin 33^\circ\ 36' \cos 12^\circ\ 48'$$
$$= .55339 \times .97515 = .5395$$
$$i_v = 57^\circ\ 21'$$

From equation (1),

$$I_v = I_n \cos i_v = 1 \times 221.4 \times .5395 = 119.4 \text{ Btu per (hr) (sq ft)}$$

Similar reasoning applies to a northwest-facing wall at the example hour. A new angle x' can be determined as $(45 + R)$, or the sine of the previously determined x can be substituted for cos x in equation (5).

Shadow Forecast and Eave Overhang

The horizontal length of shadow, *in the direction away from the sun*, cast by an object of height H is given by the formula

$$L = H \tan i_h \qquad (7)$$

where

L = length of shadow, ft
H = height of object, ft
i_h = angle of incidence of sun's rays with horizontal.

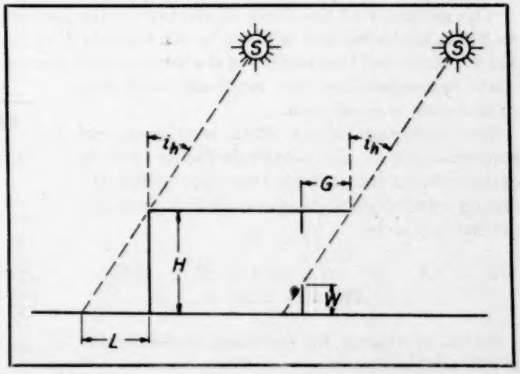

Fig. 2. Geometry of relationships: $L = H \tan i_h$; and $G = (H - w) \tan i_h$.

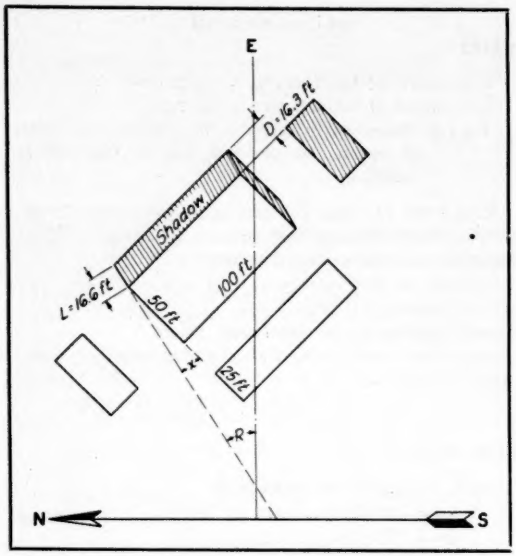

Fig. 3. Method of determining extent of shadow of a building at example hour.

The horizontal overhang of eaves *in the direction toward the sun* at height H to shade a window with its lower sill at height w is

$$G = (H - w) \tan i_h \qquad (8)$$

where G is the overhang and other symbols are as described. These relationships are shown in Fig. 2.

It should be borne in mind that the distances L and G are normal to a wall only when the wall is normal to the hour angle of the sun (for instance, at noon for a south-facing wall). At other times these distances are measured in a direction determined by angle R.

For instance, if a building 50 by 100 by 25 ft is oriented with its long axis southeast, it will cast a shadow as shown in Fig. 3.

Here, $L = H \tan i_h = 25 \times .6645 = 16.6$ ft measured along a line at angle R from the east-west line. The depth, D, of the shadow normal to the northeast wall will be $D = L \cos x = 16.6 \times .975 = 16.3$ ft.

The geometry of the depth of shadow on the southeast side is similar and is given by the formula $d = L \sin x$. Note that this angle x is the same as that previously determined for the northeast wall and, in this case, $x = 45 - R$.

The overhang at the 25-ft level *measured perpendicular* to the southwest-facing wall to exclude sun at the example hour (2 p.m. May 21) from a window with its lower sill 5 ft from the ground would be

$$G_p = (H - w) \tan i_h \cos x = 20 \times .66454 \times .97515 = 12.96 \text{ ft}$$

On the northwest, the overhang perpendicular to the wall would be

$$G_p = (H - w) \tan i_h \sin x = 2.94 \text{ ft}$$

Paint Absorptivity

Aluminum foil on a roof is no more effective in reducing the heat load on the roof than a good white paint. This fact was brought out in a series of tests at the Mellon Institute of Industrial Research (7) in which an elaborate means of setting up test samples and solar absorption measurements demonstrated the fact that aluminum foil is a poor emitter of energy in the infrared region, while white paint is a good emitter. The aluminum foil can reradiate to the sky and surroundings only a small portion of energy it receives from the sun, consequently its surface temperature rises. The white paint can reradiate most of the energy it receives to the surroundings. The net result is very little difference in surface temperatures of the two materials. Actually the true solar absorption coefficient of aluminum foil is probably very much lower than that of white paint, while practically, as far as heat gain is concerned, there is very little difference as long as their surfaces remain in their original condition.

Measurements were made of effective solar absorption, rather than true absorptivity. That is, convection and reradiation losses from the exposed surface were neglected and only that solar heat retained by the painted surface was used in calculating absorptivities.

Effective solar absorption coefficients of various paint samples are shown in Table 1. The values shown are for surfaces normal to the sun and can be modified according to solar angle using the chart and procedure previously given.

Heat Flow Through Glass

Data on heat flow through glass (8) indicate that the instantaneous rates of heat gain due to transmitted direct and diffuse radiation by vertical unshaded flat glass, differ appreciably from those presented in standard references.

Coefficients of heat transmission, U values, of shaded glass sections are shown for flat glass in Table 2.

The fraction of incident solar radiation transmitted instantaneously by sunlit flat glass at various angles of incidence are shown in Table 3 for ordinary window glass and plate glass.

In addition to the instantaneous heat gain there is a heat gain on space resulting from convection of heat absorbed by the glass itself. The fraction of incident solar radiation absorbed by flat window glass is .02

TABLE 1—EFFECTIVE SOLAR ABSORPTION COEFFICIENTS OF VARIOUS PAINTS AND MATERIALS

Material	Coefficient, E	Material	Coefficient, E
(1) Slate	0.69	(7) White	0.36
(2) Yellow	0.59	(8) Red Roof	0.86
(3) Green	0.93	(9) Aluminum Bronze	0.39
(4) Brown	0.83	(10) Aluminum Bronze	0.37
(5) White Enamel	0.42	(11) Aluminum Foil Bright	0.41
(6) White	0.51	(12) Regular Asbestos Paper	0.50
(6a) Same after 2 mos. exposure	0.68	(13) Black Asphalt Saturated Paper	0.93

TABLE 2—HEAT TRANSMISSION COEFFICIENTS OF FLAT WINDOW GLASS

Orientation	Number of Sheets						
	One	Two			Three		
	Air Space, Inches						
	None	¼	½	1	¼	½	1
	U, Btu per (sq ft) (hr) (F)						
Vertical Glass	1.17	0.61	0.55	0.53	0.41	0.36	0.34
Horizontal Glass, Heat Flow Up	1.40	0.70	0.66	0.63	.....	.....	.....

TABLE 3—FRACTION OF INCIDENT SOLAR RADIATION TRANSMITTED BY FLAT GLASS AT VARIOUS ANGLES

Incident Angle, Degrees from Normal	Window Glass		Plate Glass	
	Single	Double	Single	Double
	Percent Direct Radiation Transmitted[1]			
0	90	81	77	60
20	90	81	77	60
40	89	80	75	58
50	87	77	72	55
60	82	71	67	50
70	70	59	57	39
80	44	29	36	18
90	00	00	00	00
	Percent Diffuse Radiation Transmitted			
....	82	72	69	56

[1]These values are divided by 100 to be used as F in equation (4).

and by plate glass is about .17. For most heat calculating loads the absorption of heat by window glass and subsequent convection and radiation heat gains on the spaces are extremely small and are usually balanced by negative values of windows and doors away from the sun.

Summary

From three angles, read from an easily constructed chart of the celestial hemisphere, and a value for solar intensity on a surface normal to the sun read from Weather Bureau Data, the following relationships can be obtained:

(1) angle of incidence on horizontal,
$\tan i_h = \tan A \csc R$

(2) angle of incidence on vertical,
$\cos i_v = \sin i_h \cos x$

(3) Length of shadow in direction away from sun,
$L = H \tan i_h$

(4) Depth of shadow in direction perpendicular to a wall
$D = H \tan i_h \cos x$

(5) Eave overhang in direction toward sun to shade window
$G = (H - w) \tan i_h$

(6) Eave overhang perpendicular to wall
$G_p = G \cos x$

(7) Solar intensity on horizontal surface,
$I_h = I_n \cos i_h$

(8) Solar intensity on vertical surface,
$I_v = I_n \cos i_v$

(9) With reference to Table 1, the instantaneous heat absorbed by a surface,
$Q_{ab} = I E$

(10) With reference to Table 3, the instantaneous heat transmitted by glass is
$Q_{tr} = I F$

Construction of Sun Chart

The chart of the celestial hemisphere shown in Fig. 1 can be constructed for any latitude as follows:

Draw a circle and semi-circle of convenient diameter, say 4 or 5 inches, with a common center line and a base line closing off the arc of the semi-circle. These represent section and plan of the celestial hemisphere as shown in Fig. 4. The base line of the section and circumference of the plan represent the observer's true horizon, and the center line represents a vertical plane through the east-west axis.

On the semi-circle, draw a radius inclined to the base line at an angle equal to the latitude in which you are interested. (The example illustrated is 42°N.) At right angles to this latitude line, draw a second radius. This will represent the plane of the sun's path from sunrise to sunset on the equinoxes.

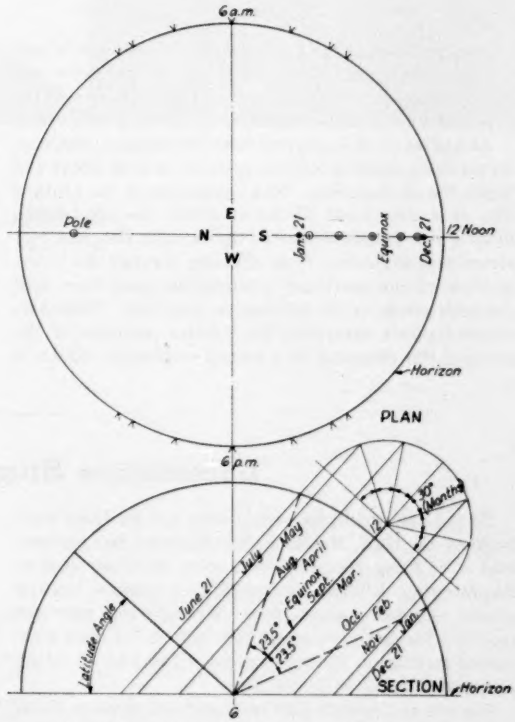

Fig. 4. Method of constructing monthly paths of sun.

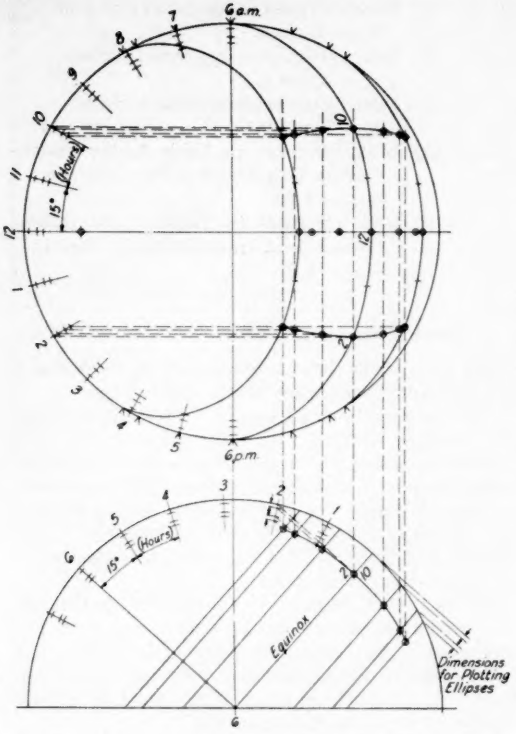

Fig. 5. Method of constructing monthly and hourly elliptical projections on chart of celestial hemisphere.

Intersections of these radii with the semi-circle represent, respectively, the position of the pole star and the position of the sun at noon on the equinoxes in the observer's celestial hemisphere.

At angles of 23½ degrees with the equinox line, construct radii intercepting the semi-circle both above and below the equinox line. On an extension of the equinox line at a convenient distance outside the semi-circle, draw a line perpendicular to the equinox line and construct perpendiculars from this line through the intersections of the previously constructed angle lines with the semi-circle to the horizon or base line. These two perpendiculars determine the solstice positions of the sun and the diameter of a second semi-circle which is constructed on the perpendicular to the equinox line as shown in Fig. 4.

This latter semi-circle should be divided into 30-degree segments which determine the position of the monthly sun lines as shown in Fig. 4.

The position of the north pole in the observers hemisphere and the positions of the sun at noon, sunrise and sunset for the various months can now be plotted on the full circle, which represents the plan of the observer's hemisphere. This is done by projecting the noon points vertically from the semi-circle to a position on the horizontal diameter of the full circle, and the sunrise and sunset points (horizon intersections) vertically from the base line to the perimeter of the circle as shown in Fig. 4.

Plotting points for the elliptical plan of the sun's paths is demonstrated in Fig. 5. At 15-degree intervals around the circle and semi-circle beginning at the vertical diameter and equinox, respectively, draw short, radial, indicator lines and mark off on these lines indications of radial distances equal to the perpendicular distances between the latitude line and intersections of the monthly lines with the perimeter of the semi-circle.

The dotted lines in Fig. 5 indicate the means of constructing the hourly and monthly lines to complete the drawing shown in Fig. 1.

While the example shown is for latitude 42°N (Chicago, Boston), a similar chart for anywhere can be constructed.

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Locomotive Shop Radiant Heated

To provide a suitable repair shop for its diesel locomotives, the Gulf, Mobile & Ohio Railroad has modernized a building formerly used as a machine shop at Bloomington, Illinois, by installing a radiant heating system in a new concrete floor. Wrought iron pipe was specified for the system; 10,300 feet of 1½-inch pipe, spaced largely on 12-inch centers, 1,740 feet of 2-inch pipe and 420 feet of 3-inch pipe.

The use of 1½-inch pipe is an unusual feature. However, since it carries 44% more water per unit length than the commonly used 1¼-inch pipe, the increased heat capacity and radiating surface, reduced flow resistance of the heating medium or increased length of pipe runs may compensate for the additional cost of the pipe.

In applications such as this where men are working on the floor and in pits below floor level, the floor coils assure warmth at this level regardless of a high rate of heat loss through large open doorways or through uninsulated walls and roof.

AIR CONDITIONING THEATERS

Louis J. DuBois
Sales Engineer, York Corp.

Air Conditioning Theaters

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A presentation of design data and charts that will prove helpful to the engineer in planning the air conditioning of theaters containing from 500 to 1,500 seats. Graphical steps simplify design procedure.

WHETHER or not television will be a factor in reducing the number of theaters in this country, remains to be seen. However, it will force theaters to offer as many attractions as possible and one of these will be a comfortable air conditioned atmosphere. This means good air conditioning design so that the system is capable of functioning efficiently and with proper results at all times.

From the management's standpoint, the most attractive arrangement is a simple adequate air conditioning system rather than one designed for high standards that will function under all possible conditions. There are many experience and judgment factors that dictate a compromise between the two approaches to give an in between condition.

Specific standards for theater air conditioning are impossible because of the great variation throughout the United States in climate, natural conditions, code requirements, engineering practice, economic needs and other factors. Basic data and general recommendations can be a starting point to which must be added the designer's experience and knowledge of local conditions and requirements.

Theater Classification

Although there are many ways of grouping or classifying theaters, for this study they are arranged into three general divisions as follows:

Large Theaters—Included are large legitimate theaters, deluxe motion picture theaters or other large auditoriums with capacities of 2,000 seats or more. This class of auditorium is in the minority and requires such individual engineering treatment, that it will not be discussed specifically.

Medium Theaters—In this group are many neighborhood theaters and those located in smaller cities. They may or may not have balconies, and range in size from 1,000 to 2,500 seats. In general, any theater in this classification that has more than 1,500 seats will require individual engineering treatment.

Small Theaters—This classification includes theaters up to 1,000 seats, generally without balconies. Many neighborhood and most small-town theaters fall into this group. They provide the major market for theater air conditioning.

In general, this article covers theaters having 500 to 1,500 seats. Theaters larger and smaller than this require different standards and dictate special individual treatment.

The average theater must give consideration to the following spaces:

Auditorium—The auditorium is the essential area to be conditioned. Depending upon its size, arrangement, balconies and usage, the auditorium may be handled as a single zone or multiple zones. Usually large balconies should be separately zoned for heating as well as for cooling. This is particularly true where smoking is permitted in the balcony.

Side Rooms—Lounges can be served by the central air conditioning system. Toilets are usually supplied with air exhausted from conditioned areas.

Foyer and Lobby—These areas, used at all times the theater is in operation, may be served by the central air conditioning system. Some zoning may be desirable. Where merchandise vending is contemplated, then special consideration must be given for additional cooling. This is particularly true where heat-producing equipment like popcorn vending machines are installed or where food products are sold which raise the odor level. Proper cooling and control should be considered where these areas are to be used as standing space for patrons waiting to enter the theater. The practice of conditioning lobbies with vitiated exhaust air from the auditorium should be discouraged, for such air is not cool enough to provide comfort and, if permitted to exhaust to the street through open doors, will make those on the street conscious of the odorous condition.

Offices—Office spaces are used even at times when the central station air conditioning system is not operating. Therefore, it is desirable to serve such areas by a separate self-contained air conditioner.

Projection Booth—The projection booth is a hot spot and should be air conditioned. Although these rooms have been handled as part of the central station system, they should be installed in conformance with local codes and regulations of the National Board of Fire Underwriters.

Ticket Booth—It is desirable to provide air conditioning for the ticket booth. In some cases, summer conditioning may be handled from the central cooling system; separately controlled spot heating equipment is desirable for heating.

Load Calculations

Since judgment and experience are required in calculating the cooling load of a theater, certain features of the design procedure deserve emphasis. The more important points to remember in calculating the load and in designing the system will be discussed.

To the number of seats in the theater must be added the expected number of standees to establish the number of occupants. The number of persons in areas other than the auditorium is usually of no consequence. Often for design purposes, a theater may be considered

to be no more than 75 to 90% occupied, providing the owner is willing to have a slight deviation in temperature and humidity when the audience is larger. In the event of such a reduction in the number of occupants, the computations or load charts should be corrected for a variation in occupancy only —not a proportionate reduction in other design factors, such as heat leakage.

The heat given off by persons in a theater constitutes 60 to 65% of the total load. Following research, ASHVE established standards for computing the amount of sensible and latent heat generated by humans in various states of activity.

TABLE 1—TYPICAL INSIDE CONDITIONS FOR THEATERS

Dry Bulb Temp., F	Relative Humidity, %	Effective Temp.	Per Cent of People Comfortable	Comments
80	50	74	70	This condition generally accepted as design standard for air conditioning systems. It is fairly satisfactory on normal jobs and has proved acceptable for most theaters, probably because temperatures are usually carried lower except during peak loads.
78	55	73	84	There is a trend toward these improved design conditions, not only for theater air conditioning systems, but also for many other comfort applications.
78	50	72.5	90	These conditions are desirable in theaters because of counter-radiation between people in close proximity.
75	55	70.5	95	While this condition may be considered close to ideal, temperature is too low for practical use because of higher first and operating costs.

Within the normal air conditioning range, heat production for the average man is taken as 400 Btu per hour per person. It could be less for women and children; it could be more for one coming in from the hot street, until a state of rest is reached, and the perspiration dried from his clothes. A variation of 10 to 15% from the average published data on heat generated by people is easily possible; such variation could result in a 5 to 10% variation in the over-all cooling requirements.

The heat generated by lighting is a relatively minor factor in the total cooling requirements for theaters, particularly in the auditorium where few lights are normally burning. The lighting load merits more consideration in any large conditioned areas outside the auditorium. Such conditions would exist principally in large or deluxe theaters.

A constant heat load is the heat equivalent of fan motors and pumps where chilled water circulation is used. An additional heat load, in many theaters, is due to popcorn machines which may add as much as one or two tons to the refrigeration requirements. The vending of popcorn and other confections in theater lobbies is now a lucrative business and may result in larger lobby areas to condition. Refrigeration requirements, therefore, may be larger.

Heat leakage and heat flow due to sun effect are closely related to and are contingent upon building construction and insulation. These not only affect the amount of heat leakage, but may cause such a lag in the heat flow that the maximum flow may occur hours after the maximum outside temperature and sun effect have been reached. Heat leakage and sun effect are dependent upon the orientation and exposure of the building. These factors can be of relatively minor importance for a well constructed, well insulated building or one having little or no exposure to the sun. Since many small theaters are of comparatively lighter construction with large exposures, these loads become more important.

While there may be a lag of several hours in the flow of heat from the outside into the theater, advantage may be taken of the heat storage capacity of the structure. By operating the air conditioning system for a period prior to the opening of the show, the interior of the theater, the draperies, fixtures, etc., may be thoroughly precooled, giving a storage effect to help carry the load over the peaks. This practice has been followed in small theaters having only afternoon and evening shows, or where small attendance in the early evening permits the use of undersized refrigeration equipment.

Where a theater has an extensive supply or return air duct system that is not properly insulated, the heat gain in summer or heat loss in winter can materially increase the cooling or heating requirements. Furthermore, excessive heat loss in the supply duct can seriously impair the efficiency of the system by causing the air temperature at remote outlets to be too high in summer and too low in winter. Therefore, duct loss should be considered in computing heat loads. Proper duct insulation is essential to minimize this load as well as to produce satisfactory results.

A number of typical inside conditions which have been used in theater design, together with comments, are shown in Table 1.

The maximum cooling load in a theater depends upon the time occurrence of the various elements of this load. The peak loads for people, outside air, and heat flow through the walls will seldom occur simultaneously. Maximum dry and wet bulb temperatures occur late in the afternoon, whereas the maximum attendance in a theater is usually around 9 p.m. Maximum heat flow through building construction, because of time lag, usually develops several hours after the maximum outdoor temperature. The pattern of theater patronage and use should be compared to the occurrence of maximum design outside conditions. It is probable that outside dry and wet bulb temperatures a few degrees below normal design conditions may be used.

A motion picture theater having continuous shows usually reaches a minor attendance peak late in the afternoon, not exceeding 60%. This goes up to 100% or over about 9 p.m. The outside air conditions which affect the ventilation load reach a peak at 4 to 5 p.m. Heat flow through the walls and ceiling, which depends upon the building construction, reaches a peak several hours after 4 to 5 p.m. The probable variation in the time of peak loads, in addition to the fact that the population load cannot be determined accurately, poses a judgment problem in determining design conditions. As a result, the size of the air conditioning equipment can be somewhat smaller than would be the case if all peaks were simultaneous. However, some concert halls or similar type auditoriums regularly accommodate peak size audiences when other peaks could occur. It is the function of the designer to determine whether the air conditioning equipment should be large enough to handle all peaks simultaneously or whether it may be somewhat smaller.

If the occupancy peak is short or of infrequent occurrence, some owners are willing to accept a slight slip in conditions. It is also possible to reduce the plant size somewhat if the outside air damper is throttled during the peak occupancy load so that more air is recirculated. The damper can be opened wider during the partial load periods to clear out any accumulated vitiated air.

In general, it is recommended that there be no reduction in the calculated loads for large theaters or those having continuous shows. Many satisfactory installations, however, have been made in small and neighborhood theaters where the load is not continuous, by assuming 80% to 90% occupancy.

Heating and Ventilating

Winter heating of a theater is principally a problem of tempering the ventilation air, keeping the house fairly warm when unoccupied, preventing cold spots around exits, entrances and stage, and properly heating the side rooms, offices and ticket booth. When a theater is unoccupied it is the usual practice to recirculate 100% of the air to economize on fuel. When occupied, the auditorium must usually be cooled because of the human heat load. Therefore, provisions for tempering the outside air to about 60F are adequate. Direct radiation is desirable for spot heating at fire exit doors, in side rooms and offices. There is no humidification problem in winter because the occupants will produce sufficiently high indoor humidities. Consequently, there is no need for winter humidification.

The quantity of outside air required for ventilating the auditorium and other theater areas are frequently set by local codes which specify the minimum amount of air which must be supplied per person. As the minimum requirements are usually adequate, they are not exceeded in designing the system.

Where there are a number of large side rooms and foyers, additional outside air must be provided. A check should be made to assure that the outside air quantity is larger than the quantity of air exhausted from such spaces as toilets and projection rooms. The outside air supply should be sufficient to prevent any odors from becoming objectionable, and to diffuse the tobacco smoke in areas where smoking is permitted.

Regardless of the quantity of outside air used for load calculations and design purposes, it is advisable to design the outside air intake and the air relief facilities to handle the full fan capacity. This will permit economical between-season operation and quick flushing out of vitiated air.

On some occasions, designs are advocated using 100% outside air at all times, with no provisions for air recirculation. The principal benefits are: Reduction in the required sheet metal and air handling equipment; elimination of a return air system; provision of a sales slogan for the theater that it uses "all fresh air." The quantity of air circulated is reduced to a minimum—usually 12 to 15 cfm per person.

The benefits do not seem to compensate for such disadvantages as:

(1) Greatly increased refrigeration equipment cost due to the use of 50% to 100% more outside air than is required for good practice.

(2) Higher operating cost for the refrigeration equipment because of the greater outside air cooling load and the impossibility of reducing the amount of outside air during the precooling period or times of light occupancy.

(3) The need for using reheat at all times except at peak occupancy calls for a steam supply summer and winter. This is an additional operating cost as well as an inconvenience.

(4) Increased susceptibility to drafts, due to the low temperature of the air introduced into the theater. If this disadvantage is overcome by reheating, it means cooling more outside air, with increased refrigeration requirements.

(5) Higher cost for winter heating, because of the need for heating more outside air at all times and the impossibility of reducing the amount of outside air during standby or heating-up periods.

Air Quantity

A wide range of air quantities has been used in theater air conditioning. Some local codes call for a minimum of 30 cfm per person which is certainly ample and usually more than is needed for good results. On the other hand, some designers, in an effort to cut costs by reducing the fan horsepower and the size of the ducts, have used 15 cfm per person or less. The proper air quantity for best results lies somewhere between these two figures. There are five factors which determine or influence the total air quantity.

(1) *Internal Load*—Obviously, enough air must be circulated to pick up the internal sensible heat and moisture. Since in the average theater this requires only about 10 to 15 cfm per person, the internal load is seldom the determining factor in arriving at the total air quantity.

(2) *Circulation*—Enough air must be circulated to insure proper diffusion to all parts of the conditioned area. Too little air or lack of air movement will cause a stale or dead sensation, regardless of temperature and humidity. Ordinarily, in theater air conditioning

there will be sufficient air for adequate distribution and circulation, even when using only the minimum quantity required for heat and moisture pickup.

(3) *Diffusion Temperature*—As the supply air quantity is reduced, the supply air temperature must be lowered to pick up the same amount of internal heat and moisture. However, the lower the supply air temperature, the more noticeable are the drafts. For this reason, the temperature of the air supplied to a conditioned area is just as important as the quantity. The difference between the supply air temperature and the theater temperature can be greater with high ceilings than with low ceilings. It is safer to use greater diffusion ranges in the front part of the orchestra, for example, than under the balcony. In general, the temperature of the air delivered to any part of the theater should never be more than 15F lower than the theater temperature.

(4) *System Performance*—If only 15 to 20 cfm per person are circulated, then any clogging of the filters between servicings is liable to reduce the air quantity to such a degree that the over-all system operation will be seriously impaired. When 25 cfm are used per person, there is a factor of safety.

(5) *Operating Cost*—There are many days when a system circulating 20 cfm or less will require refrigeration, while a 25 cfm system can operate entirely on outside air. This reduction in operating costs tends to offset the increased cost for larger fans and ducts. Above 25 cfm per person, any savings in operating costs are overbalanced by the increased initial costs.

Unless local codes specify otherwise, 25 cfm per person is generally recommended as the proper air quantity to produce the best results with reasonable first and operating costs. For any extensive conditioning of side rooms or other areas not governed by the occupancy, air quantities should be determined in the normal way.

Air Distribution

The first essential of a good air distribution system is draftless delivery of the air to all points in the theater. Since patrons must remain seated for several hours, they cannot escape the discomfort or ill effects of a draft.

As the internal load in the auditorium is due largely to the occupants, air distribution should correspond roughly to the distribution of the patrons. Allowance must be made, however, for heat leakage through any exposed walls. Air distribution in the lobby, side rooms, offices and the ticket booth must be based on the expected heat loads in those spaces.

There are three general arrangements of air distribution in theaters: Ceiling, side wall, and front or rear wall.

Where there is a balcony, there can be a combination of these arrangements, with ceiling delivery under the balcony, ceiling or wall delivery above the balcony, and front or side wall delivery to the front part of the orchestra floor.

Ceiling air distribution system is satisfactory for most applications and is particularly necessary where low headroom exists under the balcony or at the rear of the balcony. It is the most adaptable to ceiling decorations and uneven ceilings. Distribution may be by diffuser type outlets, plaques, perforated plates or slotted ducts in coves.

Side wall distribution gives fairly satisfactory results if there is a smooth ceiling, not too long an air throw, and a reasonable ceiling height.

Delivery from the front or rear is the least desirable. It is used as a compromise either to conform with the architectural treatment or for a low cost installation. If the air throws are long, the noise level will be correspondingly high, and there will be more chance for drafts and spotty conditions.

Where the air distribution system is used for heating as well as cooling, return air intakes should be carefully located. Returns at both the front and rear of the orchestra floor and in the balcony are desirable. In large houses, mushroom floor returns should be used. Particular attention should be given to the sound treatment of returns or they should be placed where equipment noises will not be carried back to the theater.

In the larger theaters, particularly those with balconies and smoking areas, it is sometimes necessary to use zoning. The balcony or smoking area should be a separate zone for both cooling and heating operations. This permits outside air to be used as necessary to dissipate tobacco smoke and odors.

Handling the Exhaust Air

Methods for handling exhaust air are frequently established by codes which must be followed. For design purposes where there is no applicable code, the following is suggested.

Auditoriums—It is preferable to provide sufficient exhaust facilities so that up to 100% of the supply air may be exhausted. This will permit the use of all outside air for between-season operation.

Foyer and Lobby—These should have exhaust facilities similar to that for the auditorium. While some exhaust may be permitted from the lobby to the street through open doors in the summer, this is not practical in the winter.

Smoking Areas—Where smoking is permitted, sufficient exhaust should be provided, preferably up to 100% of the air circulated, but not less than the actual amount of outside make-up air for such areas. Where more air is exhausted from an area than the make-up supplies, the over-all make-up quantity for the complete system must be checked. The total exhaust plus exfiltration must not exceed the total make-up air.

Toilets—Provide exhaust facilities for sufficient air to insure adequate ventilation and some summer cooling. Normally, 10 to 12 air changes per hour will be sufficient. Usually no conditioned air is supplied to toilets except in deluxe theaters. Ventilation is effected by exhaust air drawn from the conditioned areas.

Projection Room—Exhaust 100% of the air circulated if the projection room is on the central station system. If a separate air conditioning system is used for the projection room, there should be sufficient make-up air for proper ventilation. The installation should conform to any applicable codes and the rules of the National Board of Fire Underwriters.

Clean air is essential not only for patrons, but also to keep cleaning and redecorating costs to a minimum. The source of outside air should be as far as possible from street dirt, fumes or other contamination. All the air, recirculated as well as outside air, should pass through efficient filters which should be maintained in good condition. Provisions should be made for cleaning the ducts at regular intervals, for regardless of precautions, some dirt will accumulate. Return ducts, if improperly arranged, can be dirt catchers. Special care should be taken to prevent the accumulation of waste food products, for such accumulations attract rodents.

Noise

The air conditioning system in a theater must be so designed that the sound generated will not interfere with proper hearing of the performance. Therefore, acoustical considerations are of great importance.

Mechanical equipment must be selected for quiet and smooth operation. Since no mechanical equipment can be entirely quiet or free from vibration, barriers or traps must be placed to prevent the transmission of noise and vibration to occupied areas or to the sound equipment.

Ducts should be designed to prevent the transmission or generation of noise. This means reasonable air velocities, rigid construction, good dampers without sharp edges in the air stream, and quiet-operating fixtures.

Insulation

A good air conditioning system should have proper insulation. Ducts, particularly conditioned-air supply ducts, require insulation to prevent heat loss and sweating, and to insure the delivery of properly cooled air to all distribution fixtures. Heat losses in long duct runs can impair the effectiveness of an air conditioning system by causing warm spots in summer or cold spots in winter. Insulating the ceiling with 3 or 4 inches of rock wool or its equivalent will usually pay for itself, even though the building heat loss is a relatively small portion of the total requirements. Air conditioner casings and low temperature refrigerant lines should be insulated to prevent sweating.

Equipment – Costs and Operation

A proper balance between the first cost and the operating costs is always a matter of economics. If the operating time is short, as in the small-town theater having only two evening shows plus matinees on Saturday and Sunday, or if power and water costs are low, operating economy can be sacrificed to obtain low first cost. When operating hours are long, as in theaters running continuous shows from 11 a.m. to midnight; or operating seasons are long due to climatic conditions; or power and condenser water costs are high, consideration must be given to operating economy at the expense of higher initial cost. The designer should analyze the situation and make recommendations to the purchaser.

All mechanical equipment should be selected for dependability. Mechanical failures nullify the value of the entire investment, can spell financial loss, or impair the prestige of a theater. The proper selection of mechanical equipment must be based not only on the equipment itself, but upon the dependable service facilities which the seller has available for keeping the system in operation.

Due to the many variables which determine the proper air conditioning requirements, it is questionable if an air conditioning system should be designed and sold with a guarantee of conditions. From the purchaser's standpoint, a guarantee might seem the best assurance of getting an adequate system and that he will get what he pays for. However, because of the variables involved and the probability that for only a few times will all loads reach a peak simultaneously, some bidders will be tempted to take a chance on undersizing equipment. Therefore, the purchaser unwittingly places a premium on deception and makes himself open for receiving an undersized job.

Some other index of adequate capacity should be available. The most definite is probably based on experience in judging the relative consideration to be given the various elements in equipment selection. Reputable engineers are probably in the best position to recommend the proper size of equipment for a particular type and size of theater. They can then insist on getting equipment which will produce the required capacity, rather than asking bidders to meet a guarantee which is difficult to check.

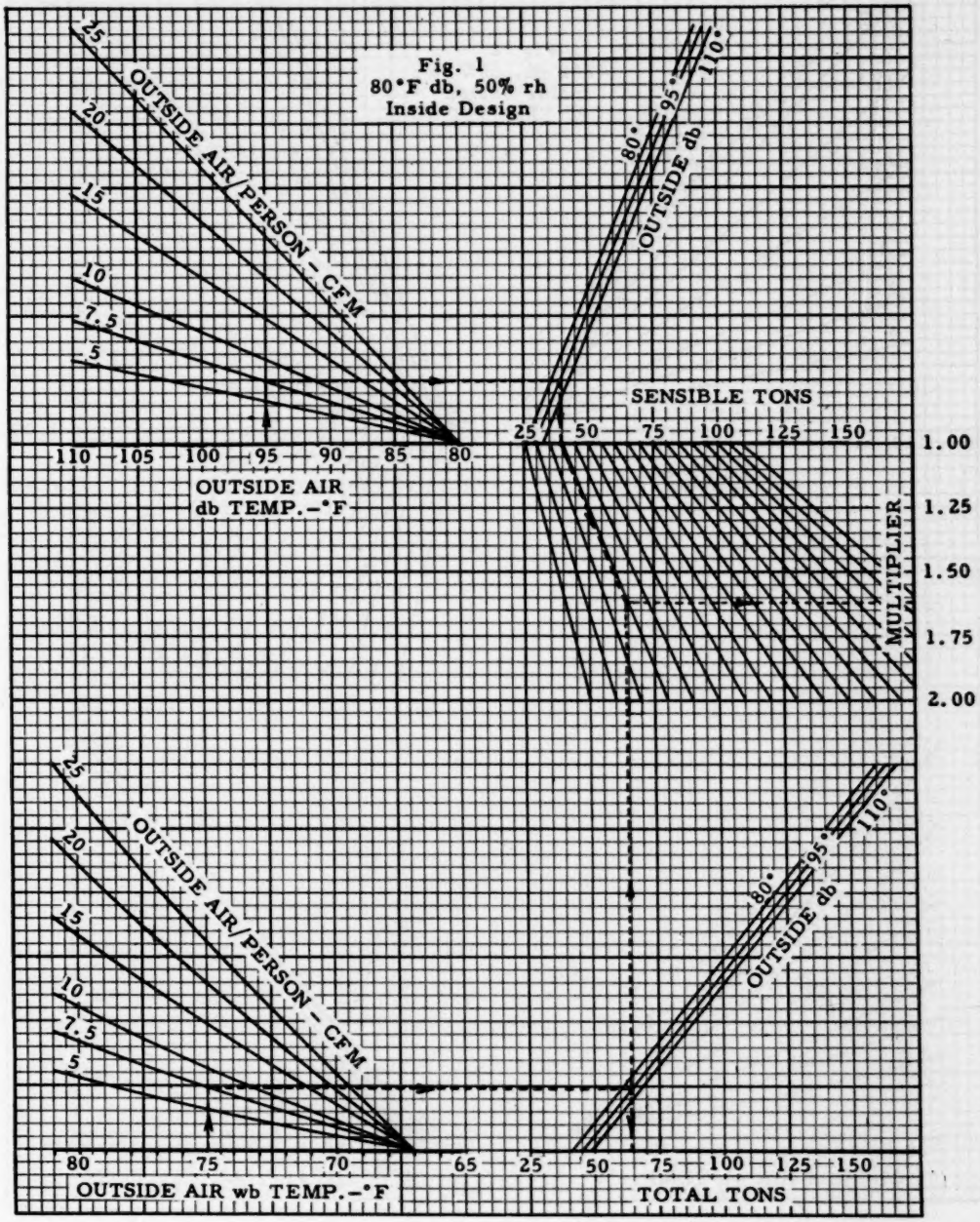
As a guide for quickly determining the approximate air conditioning requirements for the average 500 to 1,500-seat theater, Fig. 1 to 5, inclusive, provide data for various combinations of outside and inside design conditions and ventilation air quantities. The engineer should rely on judgment and experience in making this load determination. For theaters larger or smaller than indicated, or for unusual design, construction, exposure, or for more exact requirements, the designer should make individual computations.

The charts show total tons, sensible tons, and the over-all multiplier, and are based on surface cooling with no reheat requirements. When the dewpoint of the air to the cooling coils is so low that there is no moisture removal, the sensible tons reading will be total tons. Indicated tonnage requirements are per 1,000 seats.

Before getting into the actual design problems, it might be well to pause at this point to explain the term "multiplier" that is used in Fig. 1 to 8. It is merely the ratio of total cooling load to total sensible cooling load.

In making any cooling load calculations, the outside air sensible and latent loads are kept separate from the balance of the cooling requirements. The cooling load, exclusive of outside air, is known as the internal load and it consists of the internal sensible and internal latent requirements. The total internal load divided by the internal sensible load results in a ratio that is termed the internal multiplier. Internal loads are the actual cooling requirements existing within the space to be conditioned.

In theater air conditioning, in common with other

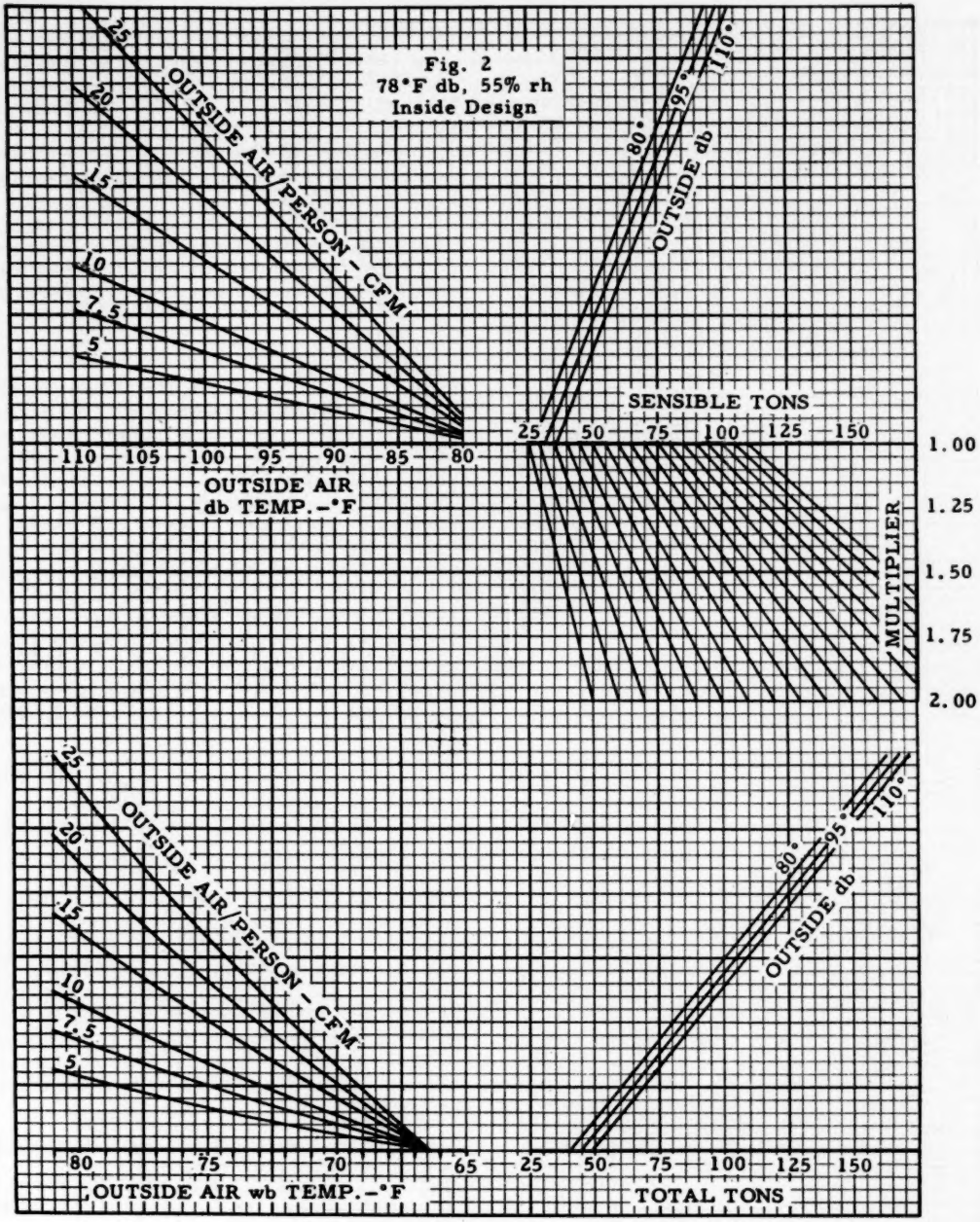


applications, it is necessary to introduce some outside air for ventilation purposes and this air is passed through the air conditioning system for cooling and dehumidification, before it is introduced into the conditioned space. This is a separate and distinct cooling which can be broken down to sensible and latent requirements. When this is added to the internal loads, previously mentioned, the result is the total cooling load. Dividing the total load by the total sensible load gives a ratio which is termed the over-all system multiplier.

The multiplier is useful in computing face areas and depth of coils and in solving other air problems.

Example 1

The method of reading the charts is indicated by the following example, shown on Fig. 1:



Size of theater	**1,200 seats**
Inside conditions	**80F db, 50% rh**
Outside conditions	**95F db, 75F wb**
Outside air	**7.5 cfm per person**

Find sensible tons, total tons, and multiplier.

For solution of this problem, follow the dotted lines as indicated in Fig. 1.

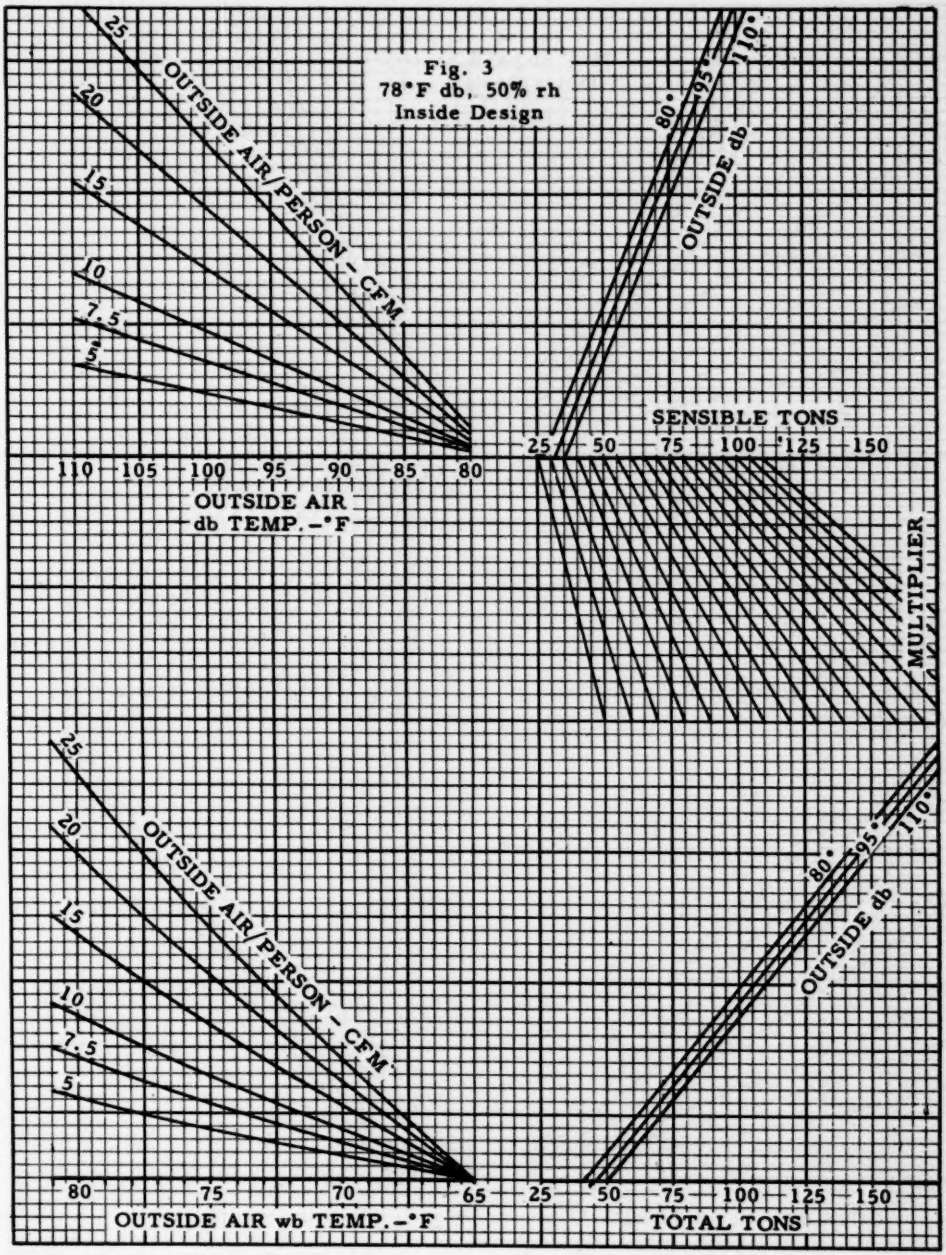
(1) ***To find the sensible tons per 1,000 seats—***

Locate 95F db on the Outside Air, db chart, move up to 7.5 cfm per person
Move right to 95F outside db line.
Drop down to 39.5 tons sensible.

(2) *To find the total tons per 1,000 seats—*

Move on 75F wb line up to 7.5 cfm per person line. Proceed right to 95F outside db on Total Tons chart. Drop down to 64 tons total.

(3) *Multiplier*



From 64 total tons, move up, and
From 39.5 sensible tons, move right and down along multiplier line, until both lines intersect.
From point of intersection, move right to 1.62 on the multiplier scale.

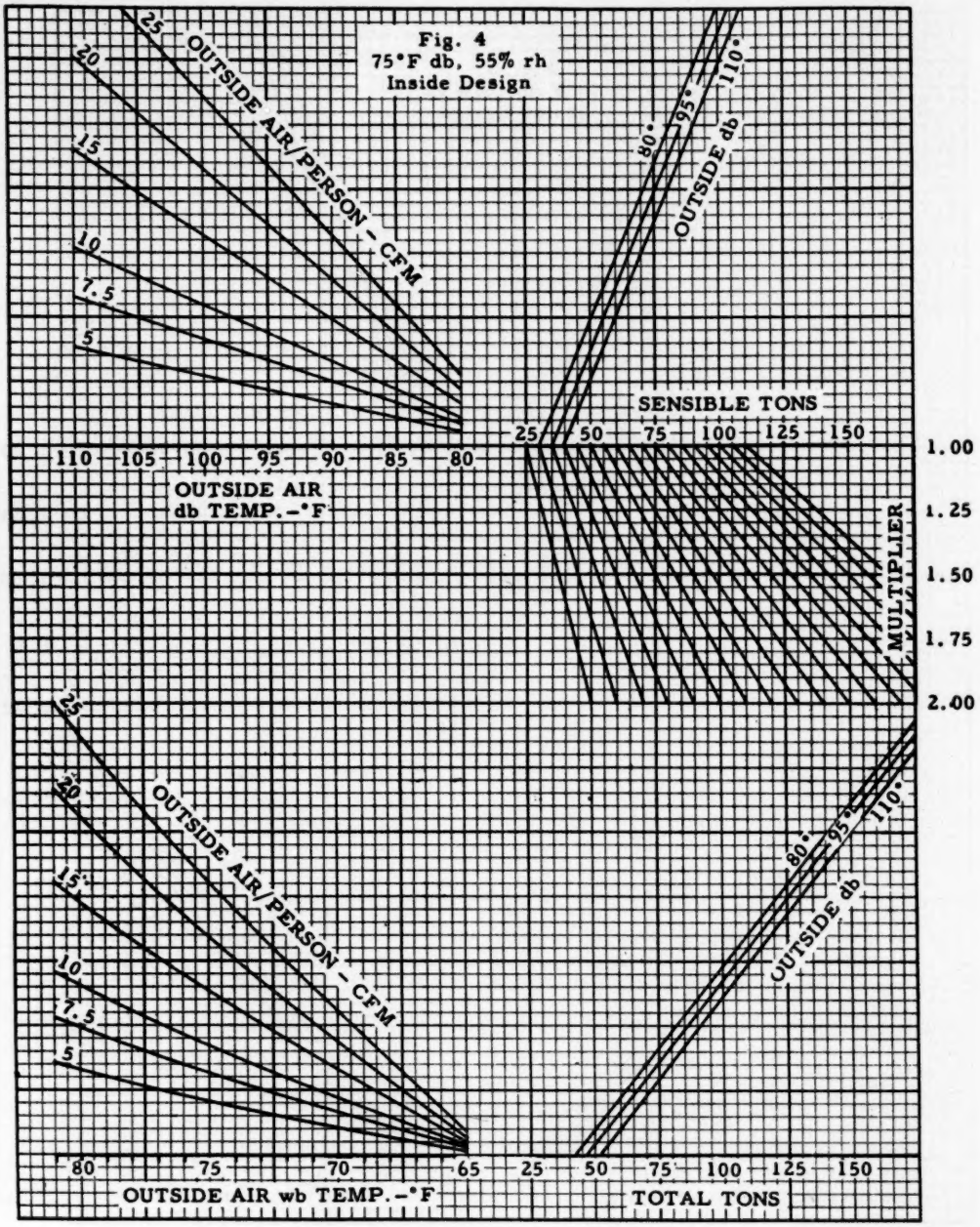
(4) *Sensible tons for 1,200 seats*

$$= \frac{1{,}200}{1{,}000} \times 39.5 = 47.4 \text{ tons}$$

(5) *Total tons for 1,200 seats*

$$= \frac{1{,}200}{1{,}000} \times 64 = 76.8 \text{ tons}$$

Fig. 1 to 5, inclusive, are based on 100% occupancy in the theater. To determine requirements for less than full load occupancy, Fig. 6 to 8, inclusive, are provided. These charts show:



(1) The internal multiplier (ratio of total internal tons to internal sensible tons) at different degrees of occupancy for 80, 95 and 110F outside dry bulb temperatures. For other outside temperatures, interpolate the curves. The internal multiplier aids in selecting cooling and dehumidifying coils.

(2) The decrease in internal tons per 1,000 seats for any variation in occupancy, for any outside dry bulb temperature from 80 to 110F, inclusive.

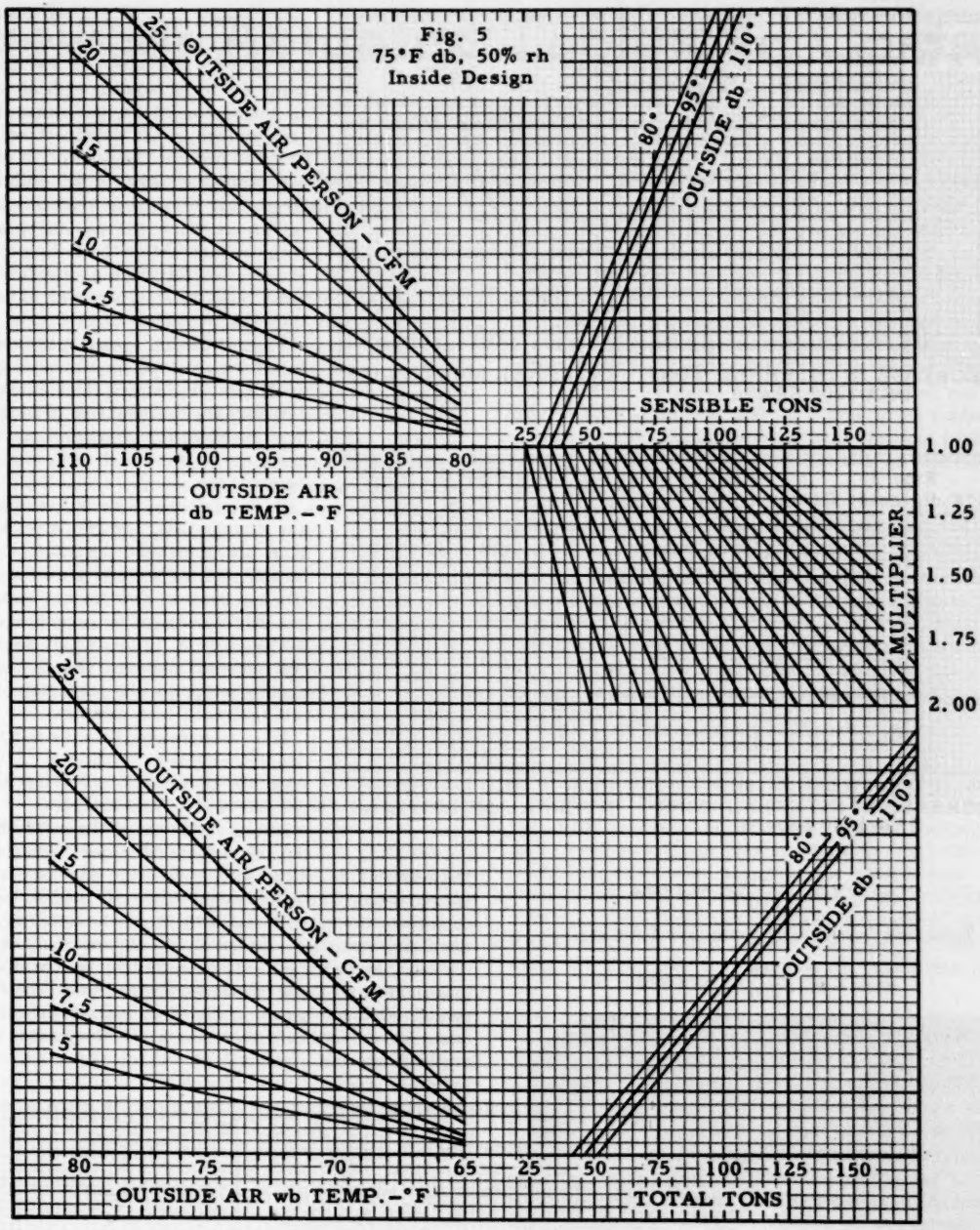
The use of these charts is demonstrated by the following example, shown on Fig. 6.

Example 2

Using the same conditions as in example, find the tonnage and internal multiplier at 50% occupancy.

(1) *To find the internal multiplier—*

In Fig. 6 locate 50% occupancy on the vertical line,



move right to 95F outside db down to 1.38 internal multiplier.

(2) *To find the sensible tons per 1,000 seats—*

In Fig. 6, locate 50% occupancy on the vertical line and move left to internal sensible line, down to 9.2 tons decrease.

Sensible tons per 1,000 seats

$= 39.5 - 9.2 = 30.3$ tons.

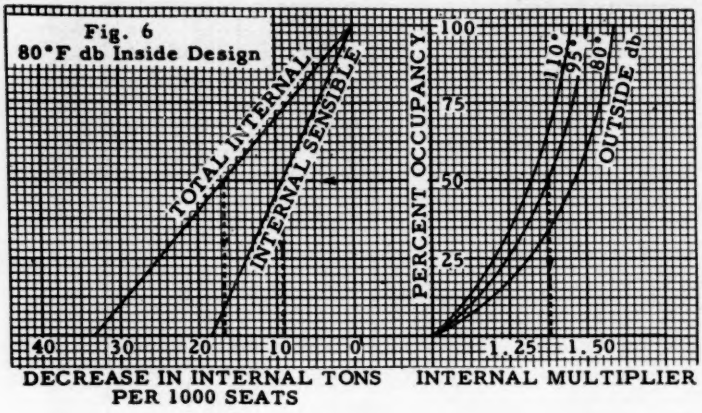
(3) *To find the total tons per 1,000 seats—*

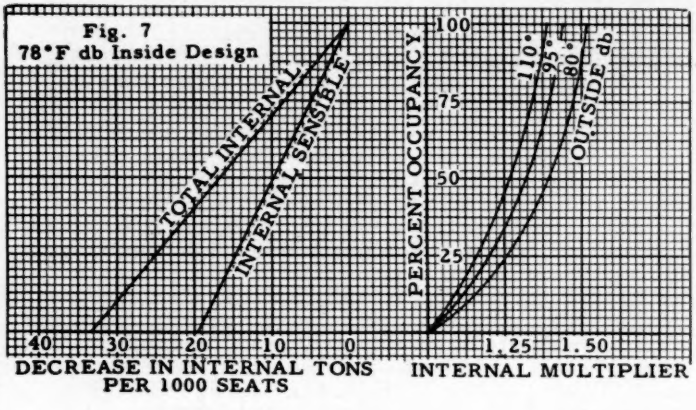
In Fig. 6 locate 50% occupancy on the vertical line and move left to total internal line, down to 16.7 tons decrease.

Total tons per 1,000 seats

$= 64 - 16.7 = 47.3$ tons.

(4) *Sensible tons for 1,200 seats—*





$$= 30.3 \times \frac{1{,}200}{1{,}000} = 36.4 \text{ tons}$$

(5) *Total tons for a theater containing 1,200 seats*

$$= 47.3 \times \frac{1{,}200}{1{,}000} = 56.8 \text{ tons}$$

(6) Multiplier (for Problem 2) $= \frac{56.8}{36.4} = 1.56$

In most theater air conditioning systems only part of the total air circulated is passed through the cooling coils and the remainder is by-passed. This is not absolutely essential but several advantages are secured. It is not necessary to use so much coil face area and the by-pass also provides a convenient and practical method of temperature control.

In systems handling a total air quantity of 25 cfm per person, up to approximately 15 cfm per person is usually required through the cooling coils during maximum loads. The coil face area and pressure drop should be based on this figure.

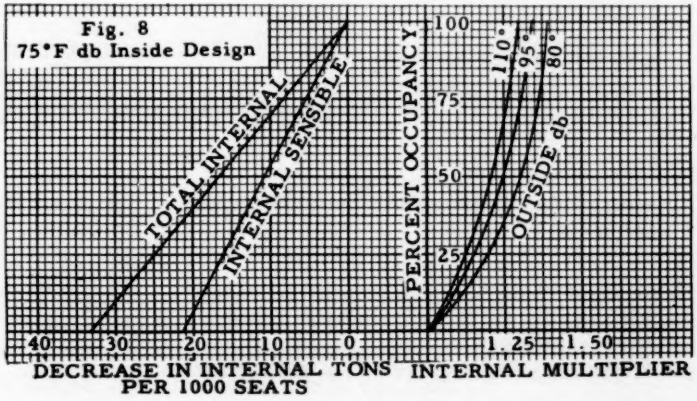
For most theater systems, 8-row cooling coils operating at 35 to 40F evaporator temperature are required and will be adequate. If the peak loads are to be handled with no slip in inside conditions, an evaporator temperature in the neighborhood of 35F will probably be needed. A 40F evaporator temperature will ordinarily permit some slip in the inside conditions when all the load peaks occur at once. After the cooling coils are selected for the design full load conditions, their performance at partial loads should be checked.

The condensing system may be selected for the local conditions in the usual way—to balance the coil selection with due consideration to suction line pressure drop. The selection will normally be for 35 to 40F suction temperature.

It is advisable that the complete air distribution system, including fans, air filters and ductwork shall be designed for the circulation of 25 cfm per person. Coil by-pass dampers should be based on accommodating up to from 70 to 75% of the 25 cfm per seat through the by-pass. Cooling coils should preferably be equipped with face dampers.

It is recommended that the theater temperature be controlled by a return air thermostat operating the coil face and by-pass dampers.

In the operation of the refrigeration system, as the load decreases, the tendency is for the suction pressure and temperature to drop. The result would be that at reduced load conditions the relative humidity would be lower than the design humidity. To maintain constant conditions, the refrigeration equipment capacity may be controlled in a number of ways to balance the coil load requirements. One way is by a step type suction pressure controller to automatically operate the compressor at available steps of capacity.



Powder Actuated Tools Cut Costs

T. W. REYNOLDS

Methods of making fastenings to metal, concrete or wood by the use of tools actuated by an explosive charge.

THE powder actuated power tool is one of the novel but practical devices that is fast revolutionizing the work of contractors. This tool, possessing as it does, the advantage of better anchorage with time and cost reduction, getting the job done on time, and lessening of worker fatigue, has therefore been largely adopted by both small and large contractors. It is now mentioned in many specifications and has the approval of insurance interests and, in general, union labor. Resulting increase in usage has stimulated competition in its production, so that at present several manufacturers market this tool.

No entangling electric or air lines are needed, the charge being simply inserted into the tool and placed against the work to be done as in Fig. 1. It is then actuated by the operator's forward thrust and the fastener is instantly set, being literally shot into place. As one contractor facetiously writes me "Its a bang-up tool in two senses of the word."

History

Being novel, one may wonder who first thought of it. Like all history, the answers soon become confused in minor details. However, it seems established that it was invented in England by Sir Stanley Temple and was first marketed under the name of The Temple Cox Cattle Killer. As such, it was a captive type tool used against the head of cattle to kill them instantaneously.

Later it was used in mines for cable splicing and rail punching; in Texas to shoot oil wells; and by the British Navy for underwater salvage and repair work. It provided a fast method for repairing ship hulls at sea. As a consequence, it was brought to this country during the war for use by the U. S. Navy and eventually went into commercial use in 1946. Robert Temple, a son of the inventor, is now design engineer for the Velocity Power Tool Company.

Applications

Just how various materials may be penetrated or secured to similar or other material is shown in Fig. 2. Since materials vary in density, hardness and thickness, the energy of the charge must be varied accordingly. Practice, in this respect, varies with the particular manufacturer. The cartridges may be .22 for the light duty tool; .38 for the heavy duty tool, loaded with Remington Bull's-eye No. 1 nitro cellulose blend; or again they may be .32 and .44 caliber in a series of loads ranging from light to heavy. In any event, the first or test fastening in any material should be made with a light charge to reduce the possibility of over-penetration.

Powder actuated tools can be profitably applied to almost any phase of a building project, from fastening wood sills to concrete footings, to the final work of attaching wood strips to concrete floors for carpet laying. They are particularly useful in setting studs and fasteners for ducts and other sheet metal work, hangers for instruments and the piping of all trades; as well as for conduit, switch and junction boxes, lighting fixtures and other components of electrical equipment.

Many contractors use them in connection with cork insulation, oil burner casings, grille ventilators, floor plates, fire extinguisher racks, conveyors, tool cribs, attaching radiator cabinets to walls, reflector materials to wall recesses, scaffolding to ceilings, and pipe racks to walls. The building contractor finds them helpful in laying furring to concrete, fastening channels for doors and partitions, and for installing metal window frames, metal lath, acoustical ceilings, awnings, venetian blinds, gutters and flashing.

Advantages

Powder actuated tools eliminate previous preparation, such as costly and laborious chipping and plugging of concrete, the drilling and tapping of structural steel, and quite often the need for pre-set bolts in concrete or masonry construction. Places normally difficult of access are more easily reached with this tool. Furthermore, its high velocity discharge, in effect, fuses the drive pin to the material, thus providing

Photo, Ramset Fasteners, Inc.

Fig. 1. Firing the powder actuated tool.

Manufacturers are Powder Power Tool Corp., Ramset Fasteners, Inc., and Velocity Power Tool Co. Should there be others, the author apologizes for any oversight.

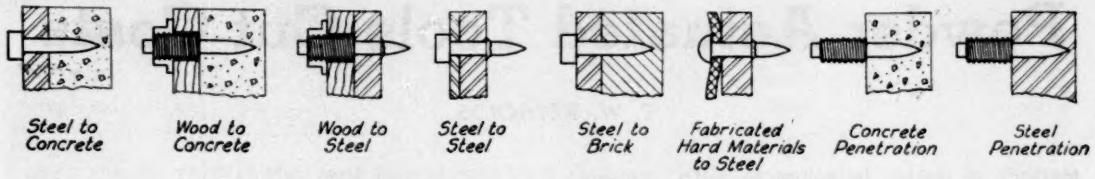


Fig. 2. Penetration of the fastening to hold together various types of material.

greater penetrating and holding power. Elaborate tests have proven that the pin is highly resistant to loosening by pull or vibrations. Holding power is up to several thousand pounds.

Usual savings with powder actuated tools are 50% over that of conventional methods of installing fastenings. Savings may even be as high as 75%, for the contractor may complete the job sooner. Time is saved even where use is only occasional. To greatly widen the possible range of work, many accessories and special fixtures have been developed which allow the use of suitable fasteners.

A Case Study

In 1950 The Trundle Engineering Co. made a comparative study on the use of the Ramset fastening system for a duct strap application. The time required for this application was but one minute, regardless of accessibility, and the total cost for time and supplies was but 23¢. This is based on 4.3¢ for time (labor at $2.57 per hour), 14¢ for drive pin, and 5¢ for the powder charge. The pneumatic hammer or electric drill method required 17 to 34 minutes, depending upon accessibility, and cost $1.02 or $1.75 for time and supplies, according to whether the location was convenient or not. This was based on 73¢ for time, 25¢ for expansion bolts, and 4¢ for two flat washers. The saving was therefore, respectively, 79¢ or $1.52. Worker fatigue was well over twice that of the previous method.

With the powder actuated tool, the only equipment required in this case study was the Ramset tool, and the only supplies, the drive pin and the powder charge. The labor involved was only to load the tool, hold the strap, locate tool to work, press the shield to the work, and then fire the pin. This application was made to both concrete and a steel beam, yet with identical results.

With the pneumatic hammer applied to concrete, or the electric drill to a steel beam, the equipment required was the pneumatic hammer or electric drill, an ordinary drill, some connection to a power source, a bench punch and a wrench, together with the supplies previously listed. The labor involved was (1) in the case of the pneumatic hammer, to star drill the hole in the concrete floor slab, insert the expansion bolt, punch the hole in the strap and bolt this strap to the concrete slab; and (2) in the case of the electric drill, to drill through the web of the steel beam, punch the bolt hole in the strap and bolt the strap to the beam.

Drive Pins

Drive pins or studs for permanent fastening are shown in Fig. 3 (a, b, and c), a steel disk being used to obtain a bearing on thin material and for attaching soft material or light gage parts. Drive pins may also be obtained with internal thread, Fig. 3d; with external thread, Fig. 3e, where required to be replaceable or removable (removable fencing, for example); or for the fastening of thick materials, Fig. 3f. Threaded couplings, straight, Fig. 3g, or reducing, may also be used when hanger rods must be attached to drive pins.

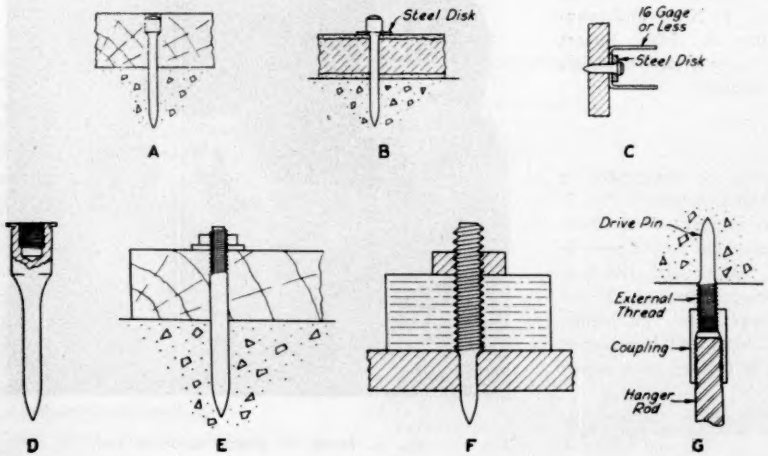


Fig. 3. Other methods of attachment. A—permanent fastening for wood. B—permanent fastening showing use of steel disk to obtain bearing area on thin material. C—use of steel disk on light gage parts. D—internal threaded stud. E — threaded removable fastening. F—means for fastening thick materials. G—coupling for hanger rods.

Photos, Velocity Power Tool Co.

Fig. 4. Fastening pipe hangers to concrete ceiling.

Powder actuated tools are obtainable in two models, one for light work, the other for heavy work, such as where the fastening must bear unusually heavy loads, or where vibrations are excessive. These models weigh about 5 and 10 lb, respectively. A complete tool kit with a standard day's supply of studs, pins and powder loads would weigh about 17 to 20 lb. However, if the kit is provided with a carrying tray it will allow the workman to carry the tool in one hand and the tray of supplies in the other so that the case itself need not be carried around.

Reactions of Union Labor and Underwriters

Trade unions view the powder actuated tool with mixed emotions, but on the whole, taking unions in the building trade on a national basis, the relationship is very good. The tool is approved by many unions and is even recommended by some in their newspapers. Usually, its use depends on local option, with each union making an individual decision. As a general rule, approval is quickly given. It is true, however, that some spotty union resistance does exist, at least at first, although consequential bans soon wear themselves out.

The union worker is naturally very much in favor of the tool since it greatly reduces worker fatigue and makes his job much easier. Any opposition is apt to come solely from business agents. As for the insurance companies, since the industrial accident record has been enviable, there has been good cooperation.

Safety and Noise

Powder actuated tools have all known safety devices to prevent accidental discharge if the tool is dropped when loaded, or otherwise misused; and to prevent ricochet of the stud should it strike material too hard to be penetrated. They have complied with all safety rules and regulations of the National Safety Council.

Safe operation of the tool depends upon reasonable care by the user. It is not a weapon. Like any other tool it is not accident proof, its use should be supervised and limited to authorized personnel. Face shields or safety goggles, similar to that recommended when using common tools for comparable work, should be required to prevent injury from flying particles.

If the metal, wood or concrete is not of sufficient thickness or grade to offer the proper resistance to the stud, there is a possibility of over-penetration of the material with the resulting hazard of a free projectile. One should check to see that no one is behind the work area. Charges, of course, should not be used in firearms as they are much more powerful than ordinary powder loads.

The tool itself should not be used where inflammable vapors or combustible materials are present. Charges should be kept separate from other supplies and equipment, while the tool when not in use or in transport, should be kept unloaded. Like all firearms, whether loaded or unloaded, it should not be pointed at anyone.

As to noise, the report is quickly over and is confined. It is not of sufficient volume to cause annoyance. Actual noise is that of the stud hitting the material. Considerable work with powder actuated tools is done in hospital additions, without complaints from the nearby patients.

Service

There are many distributors and dealers throughout the United States, each fully equipped with stock and trained respresentatives ready for service upon call. Any workman who knows how to handle welding torches, electric drills or saws, should readily grasp the proper use of the powder actuated tool.

Obviously, this tool could be made automatic as has been done with some firearms. However, its labor- and time-saving features are now so great, compared to conventional methods, that no major development work has been started for a repeater type of tool.

Fig. 5. Anchoring plumbing fixtures to a floor.

Scrapbook of Exhaust Hood Design

Part 10—Control of Fine Dust Resulting from Mixers

JOHN M. KANE
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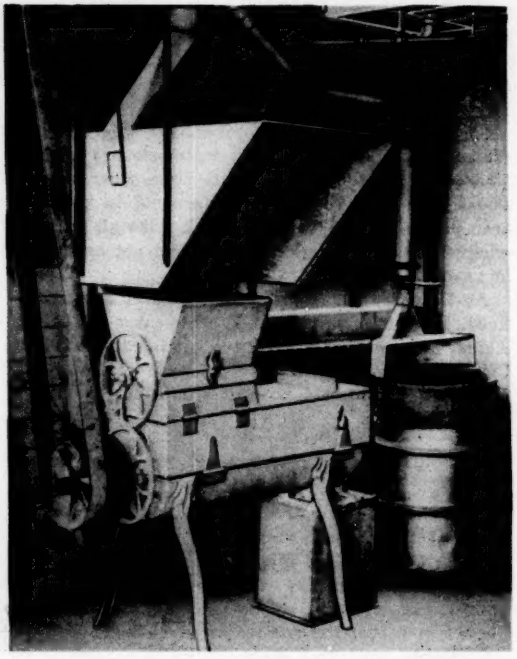

W. S. Merrill Co., Cincinnati, Ohio

Fig. 1. Local hood exhausts floating fines during mixer feed; dust-tight connection prevents escapement during discharge, and local exhaust hood at top of barrel prevents dispersion during material transfer to mixer.

IN the mixing of dry fine materials, dust will usually be released during the filling, the mixing, and the emptying operation. Exhaust ventilation volumes and method of hooding will vary with feeding methods and the design and operation of the mixer. In many operations, water or other liquids may be added during the process, in which cases dust is seldom released during the emptying operation.

Where mixer body is stationary, hooding can normally be applied that will control both the feeding operation and the dust generated during the mixing cycle. When quantities handled are smaller batches, hoods such as shown in Fig. 1 and 2 can be used. Fig. 2, when compared with Fig. 3, demonstrates the value of exhaust ventilation. Fig. 3 shows the same installation seen in Fig. 2, but with exhauster stopped. Where mixed material is discharged through feed openings by rotation of mixer, use of ball joints and telescopic joints shown in Fig. 4 will provide the control required during both filling and discharge operation.

Where quantities involved are handled in bags of conventional size, the hoods shown in Fig. 1 and 4 must be modified as shown in Fig. 2, to allow upsetting of material. Booth enclosures, Fig. 5, located over feed hopper or on floor above mixer also has application where bags or barrels are emptied. Where enclosures cannot be utilized due to handling or emptying procedures, a local hood as in Fig. 6 will control the floating dust fraction although spillage can make an added housekeeping problem.

For larger quantities of material the hood illustrated in Fig. 7 offers a complete enclosure type of exhaust hood with openings for inspection if required, and feed openings for discharge from overhead bins or weigh lorries. Skip hoist can also be used and may involve an additional exhaust hood like Fig. 8 to control the dust as material is fed into the hoist bucket. Where toxic materials are involved or where best control possible is indicated, enclosing skip hoist

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Fig. 2. A hinged cover allows access for emptying bags of material to this mixer.

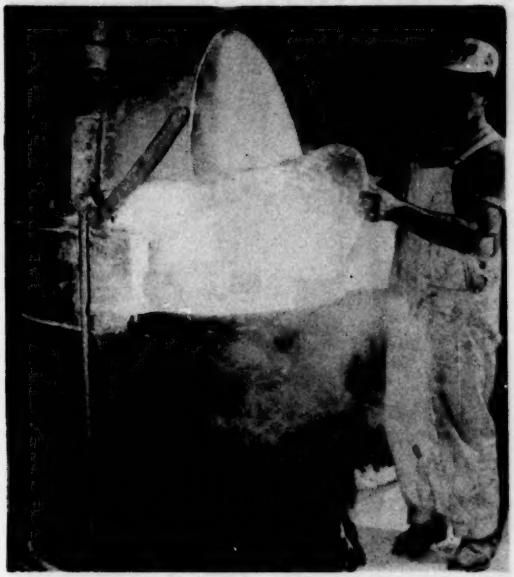

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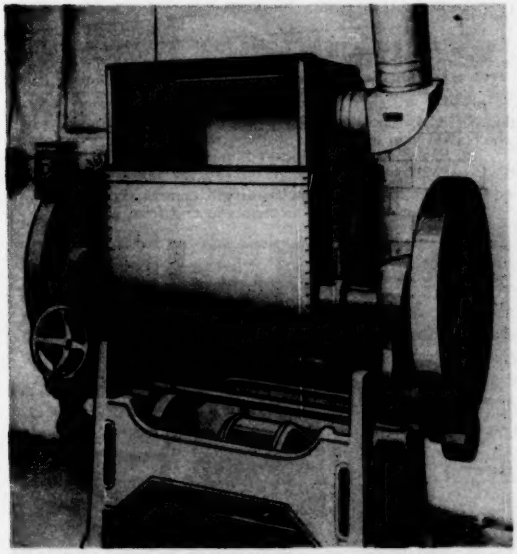
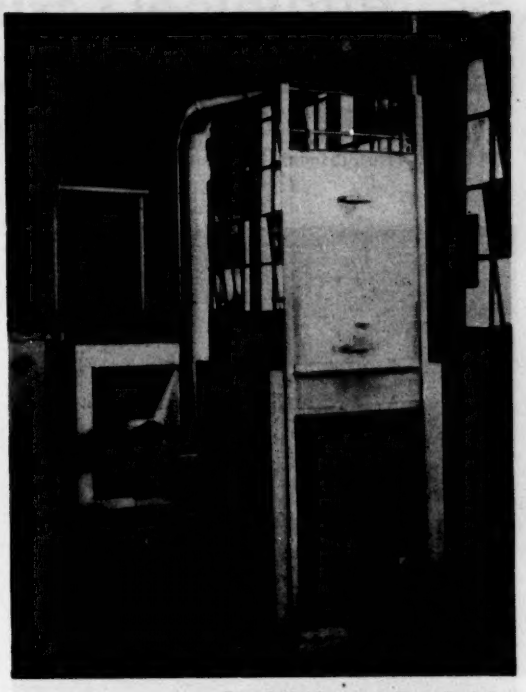
Fig. 3. Similar to Fig. 2, but with exhauster stopped to show what happens when there is no air movement into the exhaust hood.



W. S. Merrill Co., Cincinnati, Ohio

Fig. 4. By the use of swivel connections and telescopic joints, hood attached to mixer provides control for both filling and discharge operations.



Prest-O-Lite Battery, Indianapolis, Ind.

Fig. 5. The booth type hood offers one of the most effective control methods for barrel upsetting.

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Fig. 6. Local hood can be used for floor feed openings where handling prevents use of more complete enclosures.

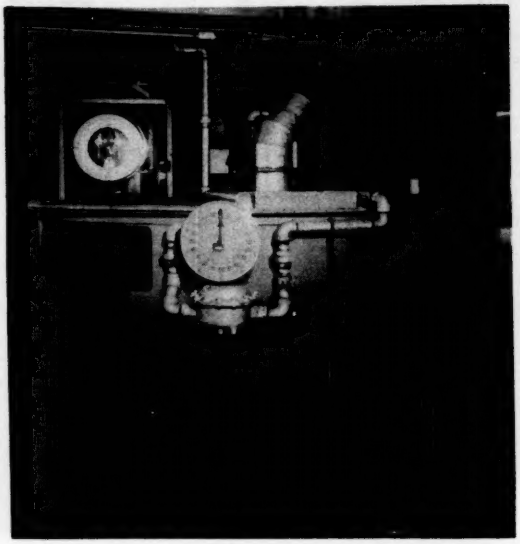
and ventilating equipment as illustrated in Fig. 9 is suggested.

Control of the discharge from the mixer will be varied to fit the material-handling method employed and the moisture content of the product.

An allied problem in many mixer rooms occurs where ingredients are scooped from barrels or bins, frequently weighed, and then transferred to a second container. Similar operations may be conducted after mixing operation has been completed. Conducting such

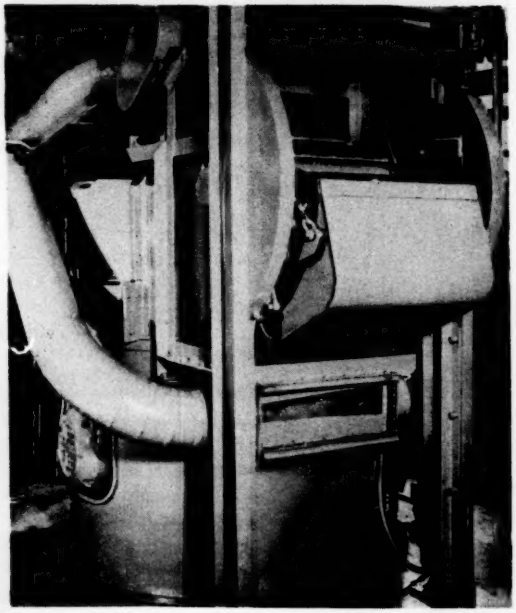
operations with a booth, Fig. 10, confines dust effectively. Local hoods at rim of barrels, Fig. 1, can also be used during container filling operation or material transfer.

Exhaust volumes for operations in this group can be calculated on indraft through hood openings of 150 to 200 fpm; through booth openings, 100 to 150 fpm.

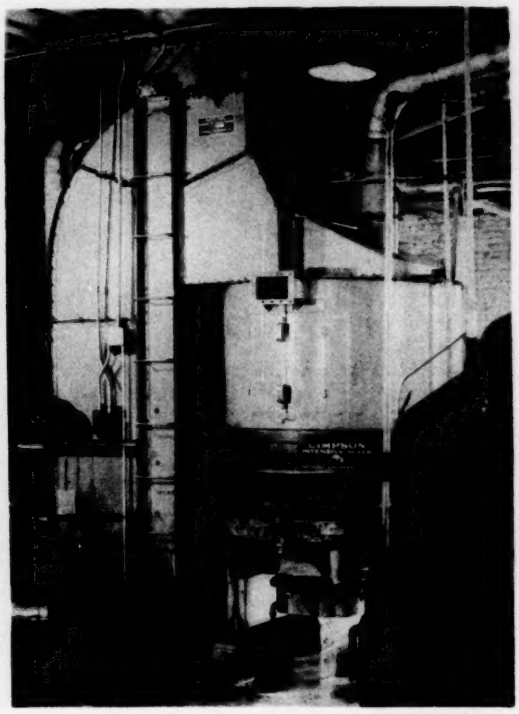


National Engineering Co., Chicago, Ill.

Fig. 7. For large mixers, a cylindrical dust hood is extensively employed with necessary openings for overhead feed and for inspection.



National Engineering Co., Chicago, Ill.

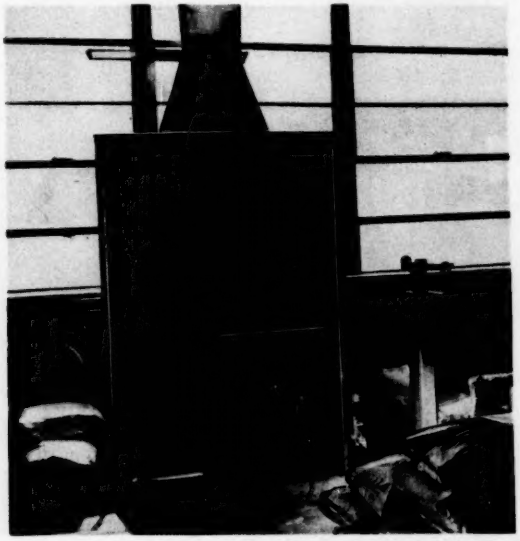


K. W. Battery, Los Angeles, Calif.

Fig. 9. For best control of skip hoist feed to a mixer, the enclosure of the skip guides to form a complete enclosure of the bucket travel area is excellent hood design.

Fig. 8 (left). Local exhaust hood at rim of skip bucket, when the bucket is in its lowered position, will prevent dust dispersion during the bucket-filling operation.

Fig. 10. Booth type enclosure will control dust released during transfer of materials to and from scales.



West Disinfecting Co., Chicago, Ill.

Review of Court Decisions

of value to air conditioning and heating contractors

LEO T. PARKER
Attorney-at-Law, Cincinnati, Ohio

AN interesting question was asked by a reader who wrote:

"What is the meaning of the doctrine of 'res ipsa loquitur'? I have a suit to defend filed by a property owner whose lawyer says I cannot win the suit because of the doctrine of 'res ipsa loquitur.' He contends that negligence of my employes who installed a furnace in his home caused the building to catch fire and burn down. The fire started in the middle of the night after my employes left the job as being O. K. and completed. Do you believe I can win the case or should I compromise and pay the property owner?"

The answer is: Don't compromise with the property owner because the chances are in favor of this contractor winning a favorable verdict.

The doctrine of "res ipsa loquitur" cannot be invoked by the jury and court unless it decides that the property owner can recover damages without proof that the fire resulted from negligence of the contractor, or his employes.

For illustration, in the leading higher court case of Hamrah v. Clements, 69 Atl. (2d) 720, reported February, 1950, a property owner sued a heating contractor for damages caused by a fire which the property owner alleged resulted from the negligence of the contractor in installing an oil burner and its connections in the existing furnace in a rug cleaning and storage warehouse.

During the trial the testimony proved these facts: The furnace was located in the middle of a large room which also contained racks upon which rugs were stored; there was no cellar in this part of the building. The rear section of the building was used in the washing and cleaning of rugs, whereas its front section was devoted to storage purposes. The contractor began work in the morning and at approximately 6 pm had nearly completed the installation of the oil heating unit. All that remained to be done the following day was to place an iron pipe underneath the floor to lead from the oil supply lines in the wall to the oil burner. In the meantime a temporary hookup to accomplish this was installed with copper tubing. This was done because the property owner requested that the burner be put in operation that night (which was a cold one) so that a 2-inch water main on the premises would not freeze.

The furnace was put into operation by the contractor and before leaving the premises he and his men checked the controls on the furnace and tested the oil flow. He set the thermostat at 55 degrees and the oil burner was running satisfactorily. Several hours later, about midnight, a fire was discovered which was confined mainly in and around the furnace room, causing considerable damage to the building and its contents.

The property owner claimed that the doctrine of "res ipsa loquitur" was applicable because it was plainly apparent that the contractor's defective installation of the conversion unit caused the fire. However, it is interesting to observe that the higher court held the contractor not liable and said:

"The cause of the fire is unknown. An officer of the fire department who was present during the fire and who assisted in an investigation immediately after it was extinguished was unable to determine the cause. A heating engineer, who made an investigation 12 days after the fire, frankly stated that he could not say what caused it. . . . The evidence completely failed to establish this essential element of the principle which they attempted to invoke. The most that the doctrine of 'res ipsa loquitur' does is to afford prima facie evidence that there was lack of due care in the particular case, and call upon the person charged with responsibility therefore to come forward with explanatory evidence to rebut the inference of negligence."

Hence, it is quite apparent that although the doctrine of "res ipsa loquitur" is applicable, a heating contractor can win the suit by proving that the injury or damage did not result from his negligence, or that the injury or damage may have been caused by another person or agency.

The general law is that a heating contractor is not liable in damages for injuries to employes, or third persons, or property, unless the testimony proves that the injury or damage resulted from the contractor's negligence. However, this rule is not applicable when the court decides to apply the doctrine of "res ipsa loquitur."

For illustration, in Mormelo v. Deakman-Well Co., 69 Atl. (2d) 212, reported January, 1950, it was shown that a contractor was in the performance of a contract for restoration of property of the Thatcher Furnace Co., damaged by fire. The contractor's employes leaned a metal-covered fire door, 9 ft x 12 ft weighing 1,200 pounds, against the building. The door was not braced to hold it in position.

An employe of the furnace company was killed when the fire door fell on him.

In subsequent litigation the higher court held the contractor liable in $25,000 damages without any proof that the contractor's employes were negligent when placing or leaving the fire door against the building without properly supporting it. In other words, the

court held that carelessness of the contractor's employes in not securely fastening the fire door in its temporary leaning position brought into effect the doctrine of "res ipsa loquitur." The court, in explaining its stand, said:

"The maxim 'res ipsa loquitur' is applicable. This rule, as applied to actions of negligence, is founded on the hypothesis that the instrumentality producing the injury was under the management or control of the defendent (contractor) and that, in the general experience of mankind, the event producing the injury does not happen unless the person in control has failed to exercise due care. In such circumstances, negligence may be inferred, and therefore the occurrence itself affords prima facie evidence of a want of due care."

What is Patentable?

Considerable discussion has arisen from time to time over the legal question: Will commercial success of an invention assure a valid patent?

Here is the law, as established by the higher court decision in National Pressure Cooker Co. v. Aluminum Goods Manufacturing Co., 162 Fed. (2d) 26. This court held that a device which is the result of mere mechanical skill is not patentable. In other words, while mechanical skill is one thing, invention is a different thing. Another important point of law decided by this court is: Commercial success in sale of the invention or evidence that the buying public wants the new device is no evidence as to its patentability.

In this case it was shown that an inventor filed an application for a patent on a heating element. The inventor claimed and proved that his invention was a great commercial success. In fact, the invention was accepted almost instantaneously by the buying public as being more advantageous and desirable than any prior invention. The Patent Office awarded a patent to the inventor. Nevertheless, the higher court held the claims 1, 2, and 6 invalid for lack of invention. This court said:

"An improvement to an apparatus to be patentable must be the result of invention, and not the mere exercise of the skill. . . . The patentee perfected a streamlined apparatus which, as already shown, possessed numerous advantages over that which was old. We think, however, that such advantages must be attributed to the skill of the art and not to invention. We hold, therefore, that claims 1, 2 and 6 are invalid for lack of invention. . . . Commercial success cannot save a patent invalid for lack of invention."

Also, see Application of Delancey, 177 Fed. (2d) 377. Here an inventor filed an application for a patent on an invention broadly entitled "For Heating Plants." The specifications stated that the invention was for an oil-fired furnace or heating plant employing a steam or hot water boiler for heating, or for supplying domestic hot water. The invention consisted of a heating plant or boiler having baffles to retard escape of the heat and to keep the pressure in the combustion chamber above atmospheric. The baffles were arranged so that they do not retard the passage of the stream of air.

The Patent Office refused to award the inventor a patent and the United States Court of Customs and Patent Appeals affirmed the verdict, saying:

"The board conceded that it is 'probably an efficient and effective device,' but denied its patentability. . . . It is apparent that appellant's apparatus broadly comprises elements found in different patents issued prior to the filing of his application."

Contractor Defaults

According to a recent higher court if a heating contractor defaults on installation contract, he has no claim against the owner for any payment. Conversely, a heating contractor is not liable in damages to a property owner for defaulting, unless the owner proves that he suffered financial loss.

For illustration, in Flem v. Twin, 58 Atl. (2d) 499, it was shown that a building owner and a contractor made a contract for installation work at $3,750.

The owner had paid the contractor $2,500 as the work progressed. Then the contractor gave up the job, or defaulted on the contract, and the owner employed another contractor to complete the work. The owner finished the work for less than the original contractor would have received for the job, and the contractor sued the property owner to recover damages based on the difference between the amount he would have received if he had finished the job, and the amount the owner paid to have the job finished. The property owner sued the contractor for damages.

The higher court refused to hold in favor of the contractor. Also, the court refused to allow the owner any damages against the contractor, saying:

"The owner has not proved any elements of damage other than the cost of completing the building and the loss of rental due to the delay. Hence he was not entitled to damages."

The Result of T-Connections

Recently a higher court held that heating contractors have good reason to avoid T-connections with two separate gas burning units.

For illustration, in Friese v. Boston Co., 88 N. E. (2d) 1, the testimony showed facts, as follows: A heating contractor installed a gas burner in a furnace in a private home. The burner was controlled by a thermostat. The furnace was connected with a chimney by means of an 8-inch pipe 6 ft in length. Three years later the contractor installed an automatic gas-burning hot water heater in the same home and near the furnace. The hot water heater had a 3-inch pipe which was joined by a T-connection to the 8-inch furnace pipe, at a point midway between the furnace and the chimney. Sometime afterward the home owner looked through a crack between the furnace door and the casing of the furnace and could see no flame, but he testified he "could hear the sound of gas going into the burner of the furnace." Immediately afterward someone in the house turned on hot water. The property owner heard the hot water heater go on and then there was a terrific explosion which blew out the furnace and heater pipes, the firebox door, and otherwise wrecked the building. The property owner was severely injured, and he sued the heating contractor for heavy personal and property damages.

The higher court held that the jury may hold the heating contractor if it decides that the explosion was

caused by connecting the automatic hot water heater pipe to the same pipe and flue which was connected with the furnace. The court said that under such circumstances the contractor was negligent because the testimony from heating experts showed that at any time the furnace pilot became extinguished and unburned gas was being carried off by the pipe and flue, a flame from the hot water heater T-connection would instantly ignite the unburned gas in the furnace pipe, and furnace. The court said:

"An expert who had had 40 to 50 years' experience as a master gas fitter, testified that in his opinion the right-angle or T-connection was the cause of the explosion. . . . The defendant (contractor) owed a duty to the plaintiff (property owner) to install the water heater in 'a workmanlike manner, with reasonable judgment, skill and care, according to the approved usages of (the) trade.'"

Who Are Deemed Laborers?

Considerable discussion has arisen from time to time over the legal question: Who are included in the term "laborer" and entitled to receive payment for work from a bonding company which furnished bond for a defaulted heating contractor?

In Western Co. v. Sales, 185 S.W. (2d) 665, the testimony showed that the May Heating and Plumbing Co. began heating work under a contract. The president of the heating company became ill and authorized an attorney to supervise carrying out the company's subcontracts. After completion of the job, the attorney presented a bill to the heating company for $3,500 for his services. The company refused to pay the bill, and the attorney sued the bonding corporation which furnished bond to the heating company.

The bonding corporation contended that it was not liable because it guaranteed to pay wages only to laborers and the supervisory work of an attorney over subcontractors did not constitute labor.

Notwithstanding this argument the higher court ordered the bonding corporation to pay the attorney because technically he was a laborer, and within the terms of the bond contract.

For comparison, see Lowenstein v. Meyer, 114 Ga. 709, 40 S. E. 726. This court held that an employe of a contractor who kept books in connection with the contractor's duties was entitled to a laborer's lien.

Also, in Cohen v. Aldrich, 62 S. E. 1015, it was shown that a person was hired as a stenographer to the manager of a heating corporation. The higher court held that the stenographer was a laborer.

And in Phoenix Co., v. Put-in-Bay Hotel Co., 66 F. 683, 685, the court held that an architect is a laborer, within the meaning of a bond furnished by a bonding company. The court said:

"One who draws such plans for a building actually does work upon it as if he had carried a hod."

When Lien is Forfeited

A leading higher court was asked to decide this question: If a heating contractor presents an unreasonable bill, through error, for work done for a property owner, does he thereby forfeit his lien? The answer is no.

For example, in Radley v. Raymond, 209 Pac. (2d) 305, it was shown that one Raymond presented a bill for repair work. In subsequent litigation the owner contended that Raymond had forfeited his right to a mechanic's lien, because his bill was unreasonable and incorrect. The higher court held:

"No mistake or error in the statement of a claim of lien will invalidate it unless the court finds that such mistake or error was made with intent to defraud or in bad faith."

In Knibb v. Mortensen, 154 P. 1109, the higher court held that a contractor forfeits his lien because of the bad faith if he claims a lien for items to which he knew he was not entitled.

Negligence of Subcontractor

Considerable discussion has arisen from time to time over the legal question: If a general contractor employs a subcontractor to install a heating system, can the property owner hold the subcontractor liable in damages for his negligence in installing the system? Another important question is: Can the property owner hold the general contractor liable for the subcontractor's negligence? Both of these questions come up in contracting work.

The higher court answered these questions in the late case of Hunter v. Quality Homes, 68 Atl. (2d) 620. Here the testimony showed a subcontractor took a contract from a general contractor, or builder named Quality Homes, to install in a home an oil burner heating unit which had a safety device thereon and an air shutter. One Hunter purchased the home. Later Hunter sued both Quality Homes and the subcontractor for damages and proved that the construction work on the house was completed only a few days before he took title and moved into the home. From the date on which he purchased the property up until the early part of October he used the oil burner very little and only to provide hot water for domestic use. Commencing on October 10 the burner was also used to heat the dwelling. On November 2d, there was a violent explosion in the heater which blew out the doors of the boiler and caused considerable damage to the building, as well as to the furniture and other personal property. Hunter charged that the explosion was due to negligent installation by the subcontractor in failing to properly regulate the burner so as to provide for an appropriate mixture of air and oil. Hunter contended that the subcontractor was liable because his negligence caused the damage. Hunter contended that the Quality Homes was liable because it built the house and was negligent in failing to cause a proper inspection to be made of the regulation of the burner.

The higher court refused to hold Quality Homes liable, and said:

"It is not alleged that Quality Homes, Inc., knew of the defective installation or practiced any fraud or concealment upon Hunter. . . . No express or implied warranty is relied upon or even asserted."

The higher court assumed a different attitude toward the subcontractor, saying that a subcontractor always is liable for injuries or damages resulting from negligence of his employes.

Allowable Spaces for Pipes

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THE accompanying table gives the allowable minimum distances between (1) two pipes, (2) pipe and wall, and (3) pipe and furring, for two pipes with standard malleable or cast iron screwed fittings in the same elevation.

Distance Between Pipes of Different Diameters

The table was developed on the basis of the following analysis: Between two pipes of different diameters, there will be two values for the minimum distance which will allow free turning of an elbow or tee. The value used will depend on which pipe is installed first. With reference to Fig. 1, the following relationships are applied:

Where the left-hand pipe is installed first,

$$x_1 = \frac{H_1}{2} + K_2 \qquad (1)$$

Where the right-hand pipe is installed first,

$$x_2 = \frac{H_2}{2} + K_1 \qquad (2)$$

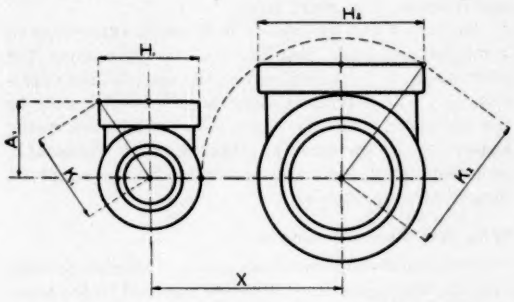


Fig. 1. Factors determining allowable space between pipes.

According to the Pythagorean theorem,

$$K = \sqrt{A^2 + \frac{H^2}{4}} \qquad (3)$$

In order that there will not be any confusion in the field as to which pipe should be installed first, the condition giving the greater distance between pipes will

MINIMUM DISTANCES ALLOWABLE BETWEEN CENTERLINES OF PIPES WITH MALLEABLE OR CAST IRON SCREWED FITTINGS IN THE SAME ELEVATION

Minimum Distance from Wall, Inches, (K in Fig. 2)	Nominal Pipe Size, Inches	Minimum Distance from Furring (Dimension F in Fig. 2), inches											
		1½	1⅝	1⅞	2	2⅛	2½	2¾	3⅛	3¾	4½	5	6
		Nominal Pipe Size, inches											
		½	¾	1	1¼	1½	2	2½	3	4	5	6	8
		Distance Between Pipes, inches											
8½	8	9⅛	9⅜	9½	9¾	9⅞	10⅛	10½	10⅞	11⅜	12	12⅝	14
6⅝	6	7⅜	7½	7⅝	7⅞	8	8¼	8⅝	9	9½	10¼	10¾	
5¾	5	6½	6⅝	6¾	7	7⅛	7⅜	7¾	8⅛	8⅝	9¼		
4⅞	4	5½	5⅝	5¾	6	6⅛	6½	6¾	7⅛	7¾			
3⅞	3	4⅝	4¾	4⅞	5⅛	5¼	5½	5⅞	6¼				
3⅜	2½	4	4¼	4⅜	4⅝	4¾	5	5¼					
2⅞	2	3⅝	3¾	3⅞	4	4¼	4½						
2⅜	1½	3⅛	3¼	3⅜	3⅝	3¾							
2⅛	1¼	3	3⅛	3¼	3½								
1⅞	1	2⅞	3	3⅛									
1⅝	¾	2¾	2⅞										
1½	½	2⅝											

EXAMPLE:—Find the minimum space required for 1¼-inch and 4-inch risers if the smaller riser is located near the wall.

SOLUTION:—The table shows 6 inches as the minimum distance between a 4-inch and 1¼-inch pipe.

Distance from wall	2⅛ for small riser
Distance between risers	6
Distance from furring	3¾ for larger riser
Total Space	11⅞ inches

Locating the larger riser near the wall would require 12⅞ inches total. Therefore, it is advisable to locate the smaller pipe near the wall or column to get a smaller assembly.

be considered. It is fairly obvious from Fig. 1 and Fig. 2 that turning the fitting on the larger pipe will require the larger space between pipes for clearance. Therefore, less space will be required if the larger pipe is installed first. Stated mathematically, it is apparent that

$$\text{where} \quad H_2 = nH_1$$

$$\text{and} \quad K_2 = n'K_1$$

$$x_1 > x_2 \text{ if } n > 1$$

Based on the given equations and American Standard fitting dimensions, the minimum distances table was developed. It is accurate to within ⅛ inch.

Minimum Distance from Wall

It is evident that the minimum distance from the wall will be that distance which will allow turning of a fitting on the pipe. This will be the distance *K* in Fig. 1 and 2. The *K* distances, accurate to ⅛ inch, are given on the left side of the table.

Minimum Distance from Furring

The minimum distance from furring (dimension *F* in Fig. 2) will be not less than ¼ inch larger than the radius of insulated pipe, because furring is constructed after pipes have been installed.

The standard thickness of insulation for heating installations is given in the following table:

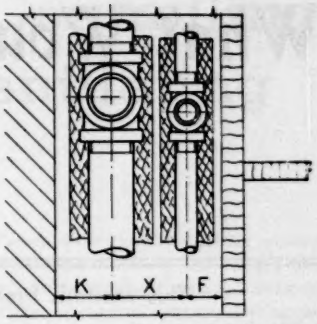


Fig. 2. Dimensions between: Pipe and wall—K; Two pipes —X; Pipe and furring—F.

Pipe Diameter, Inches	*Insulation, Inches*
½ to 1½	⅞
2 to 3	1 1/32
4 to 6	1⅛
8	1¼

Based on this insulation thickness and on standard pipe dimensions, minimum distances schedule from furring to the pipe centerline are given at the top of the table. These dimensions are also accurate to within ⅛ inch.

It should be noted that, for pipes smaller than one inch, the distance allowed for insulation is larger than that required for turning fittings. Therefore, on such small pipes, only the allowance for insulation has been considered in the table.

Unit Heating Solves Problem of Parma Church

When the Parma Evangelical United Brethren Church, at Parma, Ohio, added 10,000 sq ft of space for classrooms, nursery, ladies' lounge, etc., it increased its heating requirements proportionately.

This could have proven a hindrance, economically speaking, to Dr. H. C. Schiering's dream of a series of well-planned departments which would attract every member of the family to church on Sundays.

The church itself, founded in 1926 and with Dr. Schiering as pastor since 1927, is heated with coal. The pastor sought a heating system for the new addition which was initially moderately priced and which would maintain the heat in certain occupied areas of the building at a higher temperature than that in other sections not at the moment in use. This he believed would result in major savings in fuel, over a period of time.

Dr. Schiering found the answer to the heating problem in unit heating—with half a dozen Superfex furnaces, five of them Hi-Boys, doing the job.

Six gas furnaces may sound like an expensive proposition but they have proved otherwise for the Parma Evangelical United Brethren Church. Gas bills, from September, 1949, through May, 1950, amounted to just $220.00—and this included gas used for cooking meals in the church kitchen.

Dr. Schiering is convinced that unit heating is the most practical answer for a plant such as his. Parma Evangelical United Brethren Church is attempting to interest entire families in its program. To do so means that there must be plenty of space to house various activities scheduled for different age groups. For example, there's a nursery class for toddlers where they get their first contact with religion via stories and play; there are departments for primary pupils, the junior and senior high groups, as well as for young married couples and other adults.

To keep the temperature of all rooms at 68 or 70F in order to assure the warmth of two or three rooms where meetings are scheduled would be impractical and expensive. The present system permits maintenance of 50 to 55 degree temperatures in unoccupied rooms, higher temperatures in rooms where meetings are being held.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

This Month's Problem

We have recently installed a new water tube boiler built for 160 lb pressure which carries our entire load. We have two old HRT boilers which are allowed only 100 lb pressure. These boilers we keep only as reserve units to carry the load when the new boiler may be shut down for inspection or repair. We would like to operate the new boiler at 125 lb pressure but we have been told that all boilers connected to a single steam main must have their safety valves set at the same pressure. Is there any way in which we can operate the new boiler at 125 lb pressure and still keep the old 100 lb boilers connected to the same steam main ready for service in case of emergency? — J. L. V.

THE industrial plant engineer, in the course of his work, must solve many problems that deal fundamentally with air conditioning, heating and ventilating. Some of the situations with which he is faced may be perplexing and not easy of solution. This department is therefore being started as a monthly feature to present solutions to some of the questions considered timely or of general interest.

Each month this department will present a problem that should be of value, together with suggested solutions and descriptions of practices found satisfactory. In addition, there will be the problems that will be featured in coming issues so that readers caring to comment will have an opportunity to do so.

What is your problem? What would you do to solve the ones scheduled for future discussion? Letters regarding both are invited.

In the box on this page is the problem that was submitted for the current discussion. The following information, supplied by a well-known consulting engineer, may be helpful to others.

Suggested Solution

Rule 14-6.4 of the New York State Industrial Code (1949) states that when two or more boilers which are allowed different pressures are connected to a common steam main, all safety valves shall be set at a pressure not exceeding the lowest pressure allowed.

Following are three exceptions to this rule:

(1) When two or more boilers which are allowed different pressures are connected to a common steam main and all safety valves are not set at the lowest pressure allowed, the lower pressure boilers shall each be protected by a safety valve or valves set at the lower pressure having a combined area equal to the pipe connecting the said boiler or equal to the size of the steam main, whichever is smaller.

(2) Or the lower pressure boilers may be protected by safety valves located on the headers or outlets from the said boilers and having aggregate capacity sufficient to pass the total amount of steam that the higher pressure boilers can generate.

(3) When one or more lower pressure boilers are used for reserve purposes only, and such boilers are not operated in common with the higher pressure boilers, non-return valves located close to the lower pressure boilers may be used in lieu of the additional safety valves required under the two preceding exceptions.

While these rules apply only to New York State, they are corroborated by the following more general wording of Rule A-45 of the ASME Boiler Code (1949):

"When boilers of different maximum allowable working pressures with minimum safety valve settings varying more than 6% are so connected that steam can flow toward the lower pressure units, the latter shall be protected by additional safety valve capacity, if necesary, on the lower pressure side of the system. The additional safety valve capacity shall be based upon the maximum amount of steam which can flow into the lower pressure system. The additional safety valves shall have at least one valve set at a pressure not to exceed the lowest allowable pressure and the other valves shall be set within a range not to exceed 3% above that pressure."

New York, N. Y.

J. K. Campbell,
Eadie, Freund & Campbell,
Consulting Engineers

Problems to be Discussed

May Issue

What measures have you found effective for eliminating fog in dye houses? We have exhaust fans to draw out the fog but they only seem to make it worse in cold weather.

June Issue

What is the best location for a steam trap when the condensate has to be elevated to an overhead return main?

Laws and Regulations Controlling School Heating and Ventilating

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Here is Part 2 of a group of articles covering state laws and regulations drafted to govern the proper design and installation of heating and ventilating systems in schools.

Iowa

This state does not have specific legislation governing the heating and ventilating of schools. In the construction of new buildings, adequate facilities are provided under the direction of the architect. There is no pending legislation on this subject.

Kansas

The regulations for the heating and ventilating of schools appear in the booklet, Sanitation in Urban and Rural Schools, prepared in 1945 by the Kansas State Policy-Making Committee on Health Education.

The state requires that all plans for the construction and reconstruction of school buildings are to be submitted to the state architect for his approval, insofar as proper heating and fire safety are concerned.

For rural schools that cannot have a central heating system, jacketed stoves are recommended. The jacket should consist of two layers of metal with asbestos between. Dampers should be provided in both the inlet and exhaust ducts. The fresh air duct should have a cross section of about 12 x 16 inches and it should draw air through an outside opening in the building and not from beneath the building. The exhaust duct opening at the bottom of the flue should be about 12 x 12 inches. Flues should be lined with tile. If several stoves are used, each should have a separate flue.

Gas heating equipment should always be vented properly to the outside air.

The minimum outdoor air requirements to remove objectionable body odors during the heating season, with or without air recirculation, and without air conditioning is given in Table 4.

TABLE 4—MINIMUM OUTDOOR AIR REQUIREMENTS TO REMOVE BODY ODORS

Use of Space	Air Space per Person, Cu Ft	Outdoor Air Supply per Person, CFM
Grade school children	100	29
Grade school children	200	21
Grade school children	300	17
Grade school children	500	11
Sedentary adults	100	25
Sedentary adults	200	16
Sedentary adults	300	12
Sedentary adults	500	7

For window ventilation with gravity exhaust, radiators must be located beneath windows and extend the full length of the air inlet windows. Each radiator should have thermostatic or manual control, and metal shields in front. Glass deflectors 1 ft high are necessary at the bottom of windows. An exhaust duct with a wall opening of at least 8 sq ft should run through the roof and a cowl placed over the outlet to prevent downdrafts.

Where mechanical ventilation is installed, air velocity in ducts to rooms should not exceed 300 fpm. Each room should be served by separate dampers. With pressure ventilation, humidifying equipment should be provided.

Kentucky

This information is from the regulations of the State Board of Education. Plans for new work must be approved by the Superintendent of Public Instruction.

As a fire prevention measure, regulations require that the fire and boiler room should be constructed of incombustible material and where the ceiling is not of incombustible material, it should be finished with at least a ¾-inch coating of Portland cement applied to metal lath. A convenient means of access from the outside is required, and, in addition, the inside connection with the rest of the building is to be protected by an approved fire door. This room should be planned to permit for future expansion and should have sufficient natural light and ventilation.

For buildings that will be staffed by 8 teachers or more, a central heating system is required. The larger schools, it is recommended, should be heated by low pressure steam through direct radiation only. While warm air furnaces are permitted, their use should be confined to buildings that do not require long horizontal ducts or multiple fires. For buildings too small for a central heating plant, the heating system used should be approved by the Superintendent of Public Instruction. In all cases, the heating system should be large enough to provide a uniform temperature of 70F when the outside temperature is 0F. The inside temperature reading is taken 3 to 4 ft above the floor. All rooms, corridors, stairways and space used for school purposes are to be provided with heat.

The minimum ventilation system consists of (1) one that permits fresh air to be introduced through a raised window supplied with a window deflector and (2) exhausts the vitiated air through grilles in the lower panels of classroom doors, then through the corridor, and out through a ventilator head on the roof. Where wardrobes are used, the door to the wardrobe

should be hung sufficiently off the floor to permit vitiated air to pass under and out through a vent duct through the ceiling of the wardrobe and then through the roof.

To ventilate toilets, a vent duct should be run from the toilet ceiling, through the roof, and supplied with a vent hood above the roof.

Louisiana

The minimum requirements are that there shall be a floor area of 20 sq ft per pupil. Based on a class enrollment of 30 pupils, the minimum volume shall be 6,600 cu ft. The window area for each classroom shall be from 1/5 to 1/4 of the floor area. The ventilation system shall provide at least one complete change of fresh air every hour.

According to The Planning and Construction of Louisiana School Buildings, a publication of the State Department of Education issued to serve as a handbook for parish and city school boards, proper facilities should be provided for the storage of fuel oil. Rooms containing boilers, refrigeration machinery, transformers or other service equipment subject to possible explosion should be effectively cut off from the remainder of the building by fire walls. Entrance to such rooms should preferably be from the exterior. Adequate windows facing away from the building should be provided to relieve the pressure in the event of an explosion. If interior doors are used, they should be equivalent in value to the fire walls surrounding the rooms.

Ventilation to the attic, generally found in older buildings, is not approved.

Maine

Regulations for the heating and ventilating of schools are published in Guide and Standards for Planning School Buildings in Maine. It embodies recommendations of the National Council on Schoolhouse Construction and regulations of the Bureau of Health of the Maine State Department of Health and Welfare.

The northern part of Maine experiences colder winters than does the southern part. Therefore with steam and hot water systems, the heating plant should be sufficient to provide, without forcing, an average temperature of 70F in —10F weather in the southern part of the state and in —20F in northern Maine. Before a warm air system will be approved it should have fresh air intakes of proper size to meet general requirements, taking air from outside the building; recirculation ducts are to be sized to balance the warm air intakes; fans, where necessary, should deliver sufficient quantities of warm air at all times; warm air inlets in the room should be at least 7 ft from the floor.

Radiators should be placed beneath windows, where possible, and should extend the full width of the sash directly above. Windows over radiators should have glass deflectors to prevent drafts. Sufficient radiation is necessary to maintain a temperature of 70F in classrooms; 65F in corridors, gymnasiums and shops; 75F in lockers, toilets and dressing rooms. In general, it is recommended that heating and ventilating systems have direct radiation, with window supply type units and gravity duct exhaust in small schools, with fans provided in the larger schools.

Cast iron heaters with triple jackets are acceptable for the one-room units, if fresh air is admitted from outside the building through openings that have a cross-section area of at least 144 sq in; the openings which must open through the floor under the heater must be equipped with suitable dampers.

The ventilating system should be designed to provide a fresh air supply of 15 cfm per person for classrooms, laboratories (exclusive of fume hoods), libraries, auditoriums and all rooms where the occupancy can be readily estimated. In certain rooms, notably auditoriums having a positive supply of warm air, these requirements may be varied to meet conditions. Where there may be objectionable odors or fumes as in laboratories, shops, kitchens and food laboratories, special ventilating means should be provided at or near the source of such odors. Chemistry laboratories should have fume hoods of acid-resisting construction for the removal of objectionable odors and fumes, and provided with positive ventilation. With the exception of corridors and stair halls, each room used by pupils must have foul air ducts with openings at floor level.

Exhaust ducts or flues shall be constructed of fire resistive materials, constructed continuous from room grilles to points of exhaust outside of buildings. Ducts cannot exhaust into attic spaces. No system known as "corridor ventilation" will be approved.

Approved duct sizes are based on the following maximum velocities: Individual ducts for fans, 550 fpm; gravity systems where the rise is 15 ft or less, 200 fpm; where the rise is from 15 to 30 ft, 250 fpm; where the rise is from 30 to 40 ft, 300 fpm. For gravity ducts, use of accelerator coils or fans are recommended; they may be required where conditions warrant.

Ventilation ducts are required for classroom wardrobes. Such wardrobe ventilation may be considered as being suitable for a classroom as well, only if the wardrobe vent openings are not less than 20% larger than the required size for the classroom alone. For schools where cloakrooms adjoin classrooms, the cloakrooms shall be ventilated as separate and distinct spaces.

Maryland

The state does not have basic laws or regulations governing heating and ventilating but depends on working out a satisfactory arrangement with the individual architects for each school building.

Michigan

There is no specific law in Michigan regarding such measures in school buildings. The State Superintendent of Public Instruction is given the responsibility under the school law for approving plans and specifications for school buildings. The state regulations are not rigid and each particular proposal is considered on its merits.

Minnesota

There are no state laws on the subject but the State Board of Education has drawn up specific regulations.

Heating systems shall be so designed that it will be possible to heat separately the auditorium, gymnasium and libraries without heating other parts of the building.

Gravity heating and ventilating systems are approved only for school buildings of not more than two classrooms. With a gravity system of ventilation, 50% of the air used for heating and ventilating may be introduced as fresh air and 50% of the air recirculated. About 50% may be vented when schools are in session. However, gravity systems are seldom specified any more for the smaller buildings. It is still used in one-room rural schools not supplied with electric power.

Regardless of the system used, classrooms must have a temperature of 68F with varying designed temperatures ranging from —10F to —30F, depending on the section of the state. In corridors and workrooms, the temperature may be 60F.

The grate area of a furnace in which soft coal is burned should not be less in area than 1 sq ft to every 2,500 cu ft of schoolroom and not less than 1 sq ft to every 3,500 cu ft of other space in the building. The heating surface in direct contact with the fire or hot gases in the furnace shall be 12 sq ft for each 1,000 cu ft of schoolroom and 12 sq ft for each 1,500 cu ft of space to be heated in the building. During school hours, 50% of all air to be heated shall be drawn from the outside. Air passed through an approved air wash may be mixed with this outdoor air. The air intake shall have a cross section area of one-half the cross section area of all the warm air leaders.

In a warm air gravity system, the warm air flues to any room on the first floor shall have a cross section area at least 1 sq ft for every 160 sq ft of floor area in the schoolroom. For the second floor, warm air flues shall have a cross section area of ¾ sq ft for every 160 sq ft of floor area. In a gravity system, the vent flues from any room on the first floor shall have a cross section area of not less than ⅜ sq ft for every 160 sq ft of floor area of the schoolroom. Vent openings must be at the floor level, placed on the same side of the room as the warm air flues. If desired, part or all of the air from the schoolroom may be vented through coat rooms immediately adjoining. Satisfactory provision must be made for stimulating an upward current in vent flues. Volume dampers shall be placed at the base of heat flues. Flues of a plenum fan system shall have a cross section area of not less than 1 sq ft for every 270 sq ft of floor area of the schoolroom. Warm air furnaces should have vapor pans for moistening the air.

Steam heating systems should provide for both heating and ventilation. Generally speaking, two steam mains shall be provided—one for the direct radiation and the other for the indirect.

Where ventilating room heaters are installed, there shall be a free area between the casing that surrounds the heater and the heater of not less than the cross section area of the heater. The lower edge of the casing cannot be less nor more than 18 inches from the floor. For schoolrooms not exceeding 10,000 cu ft, the outdoor air intake shall have a cross sectional area at least 175 sq in., and so constructed that cold air cannot fall on the floor. The vent flue shall not be less than 4 ft from casing of the heater, and it shall be equipped with a vent flue. No floor registers will be approved.

The plenum chamber of a mechanical ventilation system shall be so located that the air will be as free as possible from dust, smoke, or foul odors. Provision must be made for adequate control, and dampers placed so that the intake may be closed when the school is not in session. Plenum chambers are to be kept clean at all times and are not to be used for storage purposes. Tempering coils are to be of proper size, and to insure proper temperature control each stack of the tempering coil must be separately valved.

In a central fan system, the heat and vent flues must be sized to allow for a velocity from 400-600 fpm. Velocities in horizontal ducts shall be computed on a basis of 900-1,000 fpm. Each heat flue is to have a volume damper designed so that it may be adjusted by a set-screw or other device to facilitate an equitable air distribution. With the exception of the cases where diffusers and deflectors are installed, grilles are required in all other installations. The velocity of air through grilles or diffusers should not exceed 400 fpm.

Fans must be so designed and installed that they shall be noiseless in operation. Normal fan speed shall be as low as possible. The specifications must state the type of fan used, the outlet velocity, capacity and normal speed.

A central fan system may be one of the following:

(1) A system by which each room is partly heated and wholly ventilated by air delivered from the fan. It shall also have sufficient direct radiation installed to insure 70F in the rooms when the school is in session.

(2) A system by which an adequate air delivery for ventilation is provided and heat supplied by direct radiation.

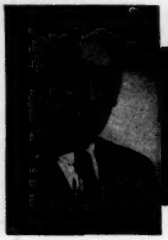
(3) A system by which the heating and ventilation is accomplished solely by the introduction of heated air.

A unit ventilating cabinet is to contain the following essential parts: Air inlet through outside walls, air filter, motor and fan assembly, heating units, cold air or by-pass chamber, mixing chamber, air outlet, and dampers for control of air supply and temperature. It is to meet all requirements for capacity and quiet operation.

Not less than 30 cfm shall be provided for each person a room will accommodate. During the times that the building is in use, as much as 75% of the air can be recirculated provided that the recirculated air has passed through an air filter or washer. When the building is not in use, then the air can be circulated, regardless of filter or washer.

When a school is equipped with a central fan plenum system, a unit ventilating system or a warm air blast system, then rooms used for classrooms or study can be vented through a separate vent flue or through an adjoining corridor, unless an individual vent flue is indicated. Such individual flues shall be provided for chemical laboratories, cafeterias, laundries, shower and

(Continued on page 135)



Experience is my Classroom

By T. W. REYNOLDS

• BUILDING TO SUIT EVERYBODY

Some months ago I sold my home. In doing so I have learned many things, to wit: Don't make your utilities too good and therefore too complex for the average prospective buyer who may have led a life of ease as an apartment house dweller and also have with him a much thumbed little book entitled "What To Look For In Buying A Home." The book may belie its title and really tell what to *look out for* rather than what to *look for*. It may even have good intentions and cover the usual house, but it will not cover the mechanical side of what an engineer may do or overdo in his own home.

Being an engineer, one pushes aside the real estate agent as not understanding the engineer's delight in mechanical things and talks so much he frightens away the prospective buyer. The engineer proudly points out all the mechanical gadgets the buyer may inherit, expounding at length on how they were incorporated in the home to overcome troubles of various kind. The buyer gets a different slant; he never knew there could be so many possible troubles. The engineer then realizes he has overplayed his hand and endeavors to clear up the matter by pointing out that the ordinary house does not have these things which in this particular house are additions for the purpose of lightening trouble.

In the apartment cell of the prospective buyer, heating was simple, and consisted of only a few radiators. The main heating plant was somewhere down below and out of his control, but this very lack of control is the cause of his moving because he wants to go where he can have heat and hot water at anytime he wishes it and in the quantity and temperature he desires. Now that these things are going to be under his control, he finds himself facing things he hadn't thought about, the complexities of valves, traps, cleanouts, thermostats, strainers, and what not. He must operate and service these gadgets. Picturing his life as that of a janitor, he envisions life no longer simple.

All the valves at plumbing and other fixtures and those on sub-mains impress him not so much as valuable, but rather as expensive. You explain that he need operate but one lone cold water supply valve at the boiler and that the other valves are there only for convenience of the steamfitter and plumber in making repair. At this he starts to worry, wants to know how much your plumbing bills run per year, inquires if all these valves constitute potential sources of leakage, and asks if you will tag all of them for him. The convenient plumbing cleanouts overhead equally depress him and soon he finds more of them in the basement floor then in the speculative type of house. What a lot of traps, cleanouts and other things to remove and service is expressed in the lines of his forehead. They don't look so nice, he comments.

All the glory of the combination of strainer with a three-valve by-pass at the pressure reducing valve on the main water supply are lost on the buyer. It will confuse him, he says, so you offer to remove the by-pass or lock the by-pass valve in closed position, but he still don't like the strainer. They are always clogging up, he says. You venture the remark that since most homes do not have a strainer, he need not have one here, so you take it out and throw it aside. Then he wants it in again, because he thinks your water must be dirty. He wants something and doesn't want it. Hot and cold he blows, and so do you.

All these possible buyers have finally educated me that simplicity is the keynote of this age. During 15 years of residence I had lived in blissful ignorance of all the things I had done wrong until these prospective buyers came along. True, I was a bit confused by them at times, because some complaints seemed so inconsistent and seemed to cancel out. Thus, the water pressure was either too high or too low, concealed radiators were not so hot, but exposed radiators were ugly and took up too much space. One spare room had no radiator and would be cold, while a second spare room had a radiator, but would use too much fuel to keep it hot. A radiator was wanted in the garage to keep the grease from congealing in the drain from the kitchen sink. So one was eventually installed, then later another party came along and wanted it out; he said the way to do things right was to install a grease trap. The fireplace, he was certain, would make the room too hot, although others thought it would make the room too cold; while others, including my own wife, said they were dirty things. The oil burner should not be in back of the boiler out of the way, but out in the open, and to this even my service man agrees. Automatic night shutdown of oil burner was no good if one had late guests, or got up early to go fishing.

One possible buyer said he didn't like men coming in to read the water meter. When told it is out in a manhole next to the street where the local utility wants it, he wonders if it will freeze up, and you wonder yourself why it hasn't. An abandoned cesspool in a remote and sheltered location on the property has been used for 15 years as a convenient dump. It is hard to convince him that it is not still being used as a cess-

pool and that no one ever stumbled into it.

So it goes, until you learn by experience that those who complain the most are trying to convince themselves they should not buy the place, or really don't want it, and that those who want to buy it are so eager to get the place they find a way around each thing that may appear wrong. Finally, you learn that you don't sell a house to anyone. They either want it or don't want it.

• HEATING STORE DOORS

Just how to overcome cold drafts from store entrance doors is an old problem and many solutions have been tried. How effective any arrangement is depends upon the severity of the particular climate, nearness of personnel to the door and the suction set up in the building by height of structure or by elevators. The number and location of entrance doors may also add to the difficulties.

One national chain store operator with two-story stores finds the accompanying arrangement quite satisfactory. This arrangement can be easily varied to suit conditions by installing the unit in the basement or on the second floor with necessary duct work to nozzle headers, the latter being shown as the alternate in the drawing.

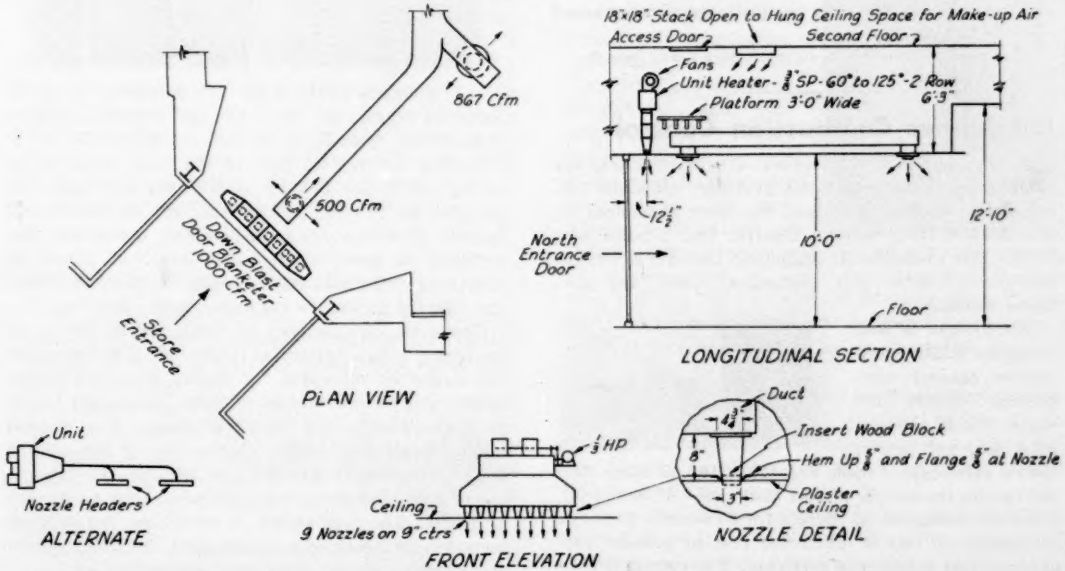
The capacity of the unit varies from 1000 cfm for a door 6 ft wide up to two units each of 750 cfm for a door 12 ft or wider. The unit is suspended from the ceiling and discharges into a plenum chamber. To this chamber are attached nine square ejector nozzles 8 inches long tapered from 4¾ inches to 3 inches at the discharge end to fit flush with the finished plaster ceiling. Air leaves the nozzles at 200 fpm. Fan outlet velocity is 1775 fpm. Cooling and supplementary heating are provided by a duct from the main air conditioning system discharging through a couple of outlets near the door.

It is, of course, necessary to admit make-up air to the hung ceiling through an opening. A fire damper may be required in this opening as shown, in which case the damper box should terminate 4 inches above the second floor. Referring to the nozzle details, the joint at each nozzle should be tight and practically invisible from below. The wood block is cut to fit tight, thus preventing the distortion of edges during plastering operations.

• SIZING BOILERS BY NUMBER OF DOORBELLS

In the good old days with two cars in every garage, the writer was engaged in the commercial side of engineering. One could then run up an unquestioned expense account of $100 in an evening. You worked up a headache in some cabaret with a customer while operating a slip stick on the big deal and yet knew in which direction the slide-rule slid.

Costs did not matter to anyone and time was lacking for covering all orders that might be obtained. In a small sales group, time passing too quickly at the noon drinks, a boiler salesman, since retired to Florida, jumped up and said he had still to make five surveys for boilers in New York City small old-time apartment houses. We went along to see how he could do it. He pulled up the car at each location, guessed the width and height of the building, counted the doorbells and from these meager data he obtained the boiler size. Somehow his system always seemed to bring satisfactory results.



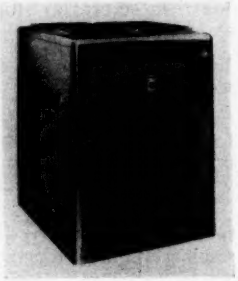
HEATING STORE DOORS: Unit heater with down blast nozzles used at entrance doors to stores.

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite Page 116 for securing additional information on items described in this department.

Cooling Unit for Furnaces

The Sunbeam Mayfair summer air conditioner has been introduced by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. The new unit is intended for use with a winter air conditioning unit and is connected to the heating duct work.



Unit has a 2 hp refrigeration system made up of twin 1 hp hermetically sealed units, each readily removable, resulting in two-step control which is said to be economical when cooling in spring or fall months.

The conditioner consists of three separate assemblies, bottom pan and jacket assembly, and the two refrigerant circuits with air plenums and canvas connections. The lower part of the unit contains the refrigerant circuits; the upper, the air chamber, filters and by-pass damper. The damper is used for by-passing the cooling coil when the heating season is in operation. There are two cooling coils three rows deep with nine tubes across the face. Freon-22 is the refrigerant. Two 16 x 20 x 1 inch glass fiber filters of the adjustable type are furnished.

Catalog Form 922 with complete specifications and capacity tables is available.

For more information, circle on Inquiry Card, **Item 1**

Oil Burner Combustion Control

A new electronic combustion safeguard system for commercial oil burners, which provides immediate cut-off of fuel in case of failure, has been announced by the Control Div., General Electric Co., Schenectady, N. Y. The co-ordinated equipment includes a switch-amplifier-contactor unit, phototube holder, and electrode holder.

The system is said to assure positive protection against combustion failure because (1) if the gas pilot does not ignite, the oil valve cannot open, and (2) if the oil flame does not ignite, the supply of fuel is cut off. After cut-off, the motor continues to operate for 30 seconds to purge the nozzle or cup of unburned fuel to prevent carbonizing and reduce field servicing. The system is then locked against further operation until manually reset.

An oil temperature thermostat can be used with the circuit in this control to assure satisfactory fuel oil temperature before the starting cycle begins. Upon resumption of service following a power failure, low water cut-off, or limit control operation during the starting cycle, the oil valve cannot open until the program switch recycles.

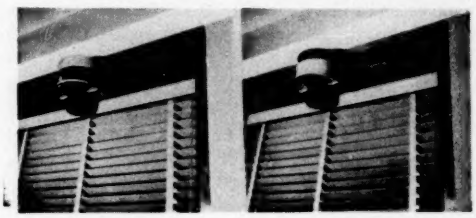
When continued operation of the burner is prevented by ignition failure, a positive lock-out mechanism is actuated and a light on the cabinet cover indicates that the equipment has gone to lock-out. Operation cannot then be resumed until the reset button is pushed.

The motor circuit is controlled directly by the built-in contactor for motor ratings up to and including ½ hp, 110/120 volts, single phase. For larger motors and for multi-phase operation, a complete line of magnetic switches is available for use in conjunction with the master control unit.

For more information, circle on Inquiry Card, **Item 2**

Draftless Window Ventilator

The Top-of-Window Ventilator, using a variable-speed motor, has been developed to draw a controllable quantity of air directly from outdoors, giving it wide distribution and thoroughly diffusing it with the inside air before reaching occupants of the room.



It is available in two sizes, furnishing, at top-speed, sufficient outside air for eight and twelve occupants, respectively, from E. R. Troxell, Jr., Bronxville, N. Y.

During the greater part of the year, from fall to spring, there are definite restrictions and basic objections to introducing outside air at window-sill height. If drafts are to be avoided, appreciable distribution is possible only at a level well above the breathing zone. Also, at the higher level, smoke, odors and vitiated air can be exhausted most effectively.

The principle involved in these ventilators is in producing a flat, horizontal trajectory of primary air, discharged by the upper fan-blades, blanketed underneath by a similar stream of room air, moved in the same direction by the lower fan-blades. This method utilizes waste heat, otherwise stratified at the ceiling; in fact, it prevents stratification and thus permits the use of cold outside air for ventilation without danger of drafts. The type shown is reversible, for exhaust purposes, by means of a window pole. Left view shows unit drawing air in; right view, exhausting air.

For more information, circle on Inquiry Card, **Item 3**

Nested H.T. Pipe Insulation

With the recent addition of curved block to the line, Kaylo high temperature heat insulation is now available in a complete range of sizes and thicknesses, according to Owens-Illinois Glass Co., Toledo, Ohio. The range covers tubes and pipes from ¼ inch in diameter to 72 inches, and vessels up to 60 feet. This helps the user to reduce cutting and fitting during application.

This insulation is made of hydrous calcium silicate which insulates effectively up to 1200 deg and is available in all standard sizes of block and in thicknesses from 1 to 6 inches for flat surface insulation. As preformed pipe covering it is made in sectional form (two pieces to the circumference) for all standard tube or pipe diameters from ¼ to 12 inches; tri-segmental form (three pieces to the circumference) for pipes and tubes up to 23 inches; quad-segmental (four pieces to the circumference) for pipes and tubes up to 41 inches; K-segmental (curved pieces 18 inches wide) for pipes and tubes up to 72 inches; and curved block nominally 18 inches wide for large vessels up to 60 feet in diameter. For diameters larger than 60 feet, flat block is used.

All pipe covering is made to simplified dimensional standards, which means that the outside diameters of the pipe coverings correspond to the outside diameters of standard pipes. These pipe coverings, therefore, can be nested. Pipes may be covered with single layers of the insulation up to 6 inches thick, or thicknesses may be built up by nesting. Their interchangeability allows the user to reduce the number of sizes kept in inventory by as much as 40%.

Its extreme light weight, 11 pounds per cubic foot, makes this covering easy to handle. Its high strength minimizes breakage and makes possible the large sizes which mean fewer pieces needed to cover a given area. Its insolubility in water cuts water damage.

For more information, circle on Inquiry Card, **Item 4**

Hot-Cold Water Equalizer

The Lawler water pressure equalizer has been introduced by Lawler Automatic Controls, Inc., Mount Vernon, N. Y. It is designed to maintain equal pressures in the hot and cold water lines to fixtures regardless of any variance in pressures in the supply lines.

When there is equal pressure in the hot and cold water supply lines, equalizer passes an equal amount of hot and cold water. When there is a sudden demand for one or the other, the equalizer counteracts the change in pressure by a system of valves and by-passes that acts on a diaphragm, closing down on the higher pressure line and at the same time increasing the opening of the lower pressure line. Equalizer is furnished with union ends and fitted with by-passes.

Equalizer is available in six pipe sizes from ½ inch to 2 inches. Maximum hot and cold water pressure should be specified.

For more information, circle on Inquiry Card, **Item 5**

Electronic Steam Heat Control

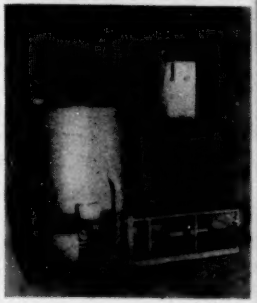
An electronic control for engineered steam heating systems is announced by C. A. Dunham Co., Chicago, Ill. All control panels now being manufactured for Dunham systems are equipped with the RST-EA-A electronic amplifier. The amplifier, which indicates and controls temperature changes, replaces a galvanometer as nerve center for the panel.

The amplifier offers two advantages over the galvanometer. It gives more reliable operation because it has fewer parts. It costs less to maintain because radio tubes will be its chief replacement need.

For more information, circle on Inquiry Card, **Item 6**

Air Filter Cleaning Machine

Permanent type filter elements used in air conditioning systems may now be cleaned at a speed many times faster and with less work involved than by methods generally in use today, according to Paxton-Mitchell Co., Omaha, Neb. Called the Safe-N-Ezy air filter washer - oiler, the new machine is being used successfully by leading railroads for cleaning air filters used on Diesel locomotives and passenger cars, which are the same permanent type filters used in many air conditioning and ventilation installations.



One of the washers operated by one man working at a normal rate of speed can clean 600 or more 19½ x 19½ x 2⅛ inch size air filters in an eight-hour day. With the hose and vat method, it would take a crew of four or five workmen to accomplish the same job.

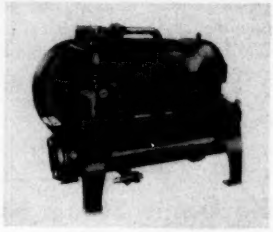
The machine works on the principle of centrifugal force. Filters spin in the interior basket of the washer throughout the complete cycle, so that they are thoroughly cleaned, rinsed, spun dry and oiled all is one continuous operation.

Since the machine occupies such a small floor area, only 6 ft 10 in. x 4 ft 4 in., it can be conveniently installed in an out-of-the-way location where it will not interfere with regular working operation.

For more information, circle on Inquiry Card, **Item 7**

10, 15 hp. Condensing Units

Addition of a 10 and 15 hp water cooled condensing unit to its line is announced by Par Compressor Div., Lynch Corp., Toledo, Ohio. Suitable for commercial refrigeration and air conditioning applications, these units are built to give heavy duty service.

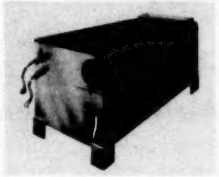


The condensing units feature V-belt drive with safety guard, dual pressure control, magnetic starter with thermal overload protection and water regulating valve mounted on a heavy base. Freon-12 is the refrigerant.

For more information, circle on Inquiry Card, **Item 8**

Adsorbent Type Dehumidifier

A new adsorption-type dehumidifier, Model 100, is announced by Dryomatic Corp., Alexandria, Va. It is effective singly in enclosed areas up to 25,000 cubic feet.



The unit can give precise humidity control in a wide range of temperatures — from —40 deg to plus 100 deg, making it ideal for maintaining low humidity levels in cold storage plants and unheated warehouses for year-round dry-cold protection. Relative humidity levels as low as 15% can be maintained.

The device measures 45 x 19 x 16 inches, and operates on 110-volt AC current. It is priced at $594.

For more information, circle on Inquiry Card, **Item 9**

Concrete for Radiant Heating

A development in concrete which is expected substantially to reduce the cost of radiant heating and thus enlarge its field of application, has been perfected by Products Planning Co., Pittsburgh, Pa. Basically, the invention comprises a formula of special aggregates which are blended and then added to concrete and other plastic masses. The blended aggregates greatly increase the heat conductivity and also the wearing qualities of concretes sold in commercial grades.

The higher heat-conductivity of the new concretes is said to mean a saving in pipe for radiant heating of from 25 to 30% per installation as compared with the quantity of pipe required with standard concrete. Cost of the product will be only about 10% of the total savings achieved. The product is particularly important in this period of defense shortages, since it will conserve pipe in heating.

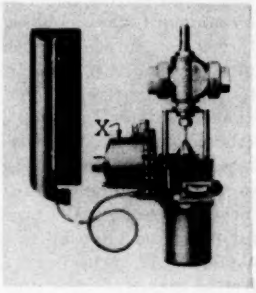
An originally unforeseen feature of the development has been that the aggregates impart a marked increase in concrete wearing qualities. Various mixtures will be made available to meet severe traffic conditions in plant floors and for high-density traffic highway areas.

When the mixtures are used only for increasing wearing qualities, and heat transfer is not involved, they can be applied to the top surface layers of concrete, thus holding costs to a minimum.

For more information, circle on Inquiry Card, **Item 10**

Modulating Control System

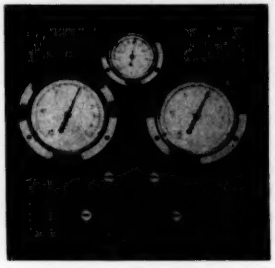
A new modulating control, Sarcostat Type W, actuated by outside temperature and steam pressure, and intended for steam and hot water systems, is introduced by Sarcotherm Controls, Inc., New York, N. Y.



The control consists of the master control (top view, right), a liquid-filled outdoor bulb (top view, left), and a control panel (bottom view).

The control automatically feeds only enough steam to the building, heating zone or convertor to balance its heat loss under any given weather condition. Equal distribution is assured through the use of orifice plates in steam radiator valves. The control panel provides night shutdown and quick morning pick-up at any predetermined time.

The master control is fitted on the main steam line or in each zone. In hot water systems supplied through convertors, this control is installed in the steam supply to the convertor. The throttling position of the valve is determined by the outdoor bulb and also by the steam pressure existing in the system or convertor.



The outdoor bulb acts to open the valve wider as the outside temperature drops. However, mechanism *X* saves heat by preventing the valve from opening any wider than is required to provide sufficient pressure in the system for a given outdoor temperature. Mechanism *X*, actuated by the steam or vapor pressure in the system, positions the fully modulating valve at various intermediate points.

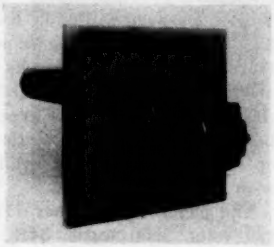
The standard control panel has a 4-position switch and a combination time switch for automatic night shutdown and morning pick-up. Optional panels can be furnished to include temperature and pressure indicators.

The master valve is available in sizes from 1 to 8 inches.

For more information, circle on Inquiry Card, **Item 11**

Exhauster for Garages

The G-636 exhauster designed specifically for garage ventilation has been introduced by American Machine Products Co., Marshalltown, Iowa.



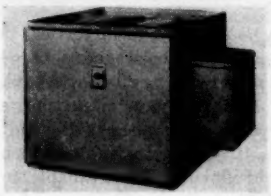
The exhauster is anchored to the wall at a determined height overhead with the exhaust pipe running through the wall, and with a 4-inch galvanized elbow outside the wall, turned down to prevent rain or snow from entering the system. Another 4-inch elbow is attached to 4-inch drain pipe to extend over the car stalls, and above each stall a 2 x 4 inch tee is placed.

Flexible tubing it attached to this duct main and connected to the exhaust pipe of the automobile.

For more information, circle on Inquiry Card, **Item 12**

Home Electric Air Cleaner

The Magne-filter air cleaner is a 1951 product of American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. This electronic dry-type air cleaner removes dust and dirt from the air by electrical attraction and is installed in the return duct of any air heating or cooling system. It is made in sizes to meet all residential installation requirements.



The filter removes pollen, air-borne bacteria, and other microscopic particles, as well as fine dust or smoke causing grime or smudge on walls and furnishings. Because the device has filter cells as its collector elements, it will continue to filter the air if the electrostatic action is interrupted.

The air cleaner is installed directly in the return duct of the heating or cooling unit. It can be installed either vertically or horizontally, according to the position of the duct.

There are seven sizes, having two to eight filter cells, with an air volume up to 600 cfm for the smallest size, and from 2,100 to 2,400 cfm for the largest. These sizes are applied to heating units whose output at the register ranges up to 64,800 Btu per hour for the smallest size, and from 227,000 to 259,000 Btu per hour for the largest. Shipping weights are approximately 90 to 250 pounds.

The electrostatic action is produced by a power pack similar to the power units in radio and television sets. It steps up the regular 110-volt lighting current to a higher potential and changes it, with rectifier tubes, from alternating to direct current. This current is then applied to the filter cells through metal grids, producing a strong electrostatic field that attracts and holds dust, dirt, and smoke particles in the filters. The cleaner consumes about as much electricity as a 25-watt bulb. It requires no water or drainage connections.

For more information, circle on Inquiry Card, **Item 13**

Union for Light Wall Pipe

The Speedline tube and pipe union, combining the best features of the screwed pipe union and the sanitary tube union, has been developed by Horace T. Potts Co., Philadelphia, Pa. It is low in cost because it weighs less than conventional fittings and it is bimetallic. The hex nut is made of carbon steel or Monel, while parts coming in contact with corrodents are made of metals best suited to the particular applications.

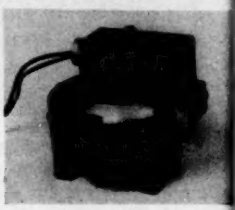
It is claimed that this new union removes leakage problems which are sometimes encountered with corrosion-resistant ground joints. The union permits the use of light-wall piping systems to handle pressures for which the tubing or pipe is designed.

In both tube sizes and nominal pipe sizes, the union is made for ½ through 4 inch applications.

For more information, circle on Inquiry Card, **Item 14**

Variable Frequency Gas Control

An automatic control system for gas-fired heating systems that is said to reduce underheating and overheating is announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Nucleus of this system is a thermostat of improved design and sensitivity. It regulates the frequency of burner operation so that heat is provided in smaller portions in mild weather and in progressively larger amounts as the outside temperature drops.



Since there are no long on and off periods, overheating and underheating is reduced.

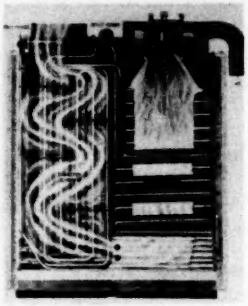
Included in the control package is a special diaphragm gas valve (illustrated) which has been virtually soundproofed, an important factor when heating units are located in or near living areas. The diaphragm is operated by an integrally mounted relay type controller with a small, precision-made 3-way pilot valve. The valve functions equally well when used with natural, mixed, or manufactured gases.

The gas control package is available in either plug-in transformer or plate-mounted transformer models, for AC or DC line voltage, or for 2-wire low-voltage circuits.

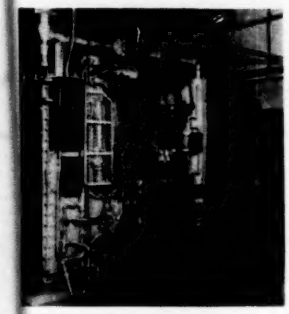
For more information, circle on Inquiry Card, **Item 15**

Recirculation Steam Generator

A compact, reliable steam plant, culminating a five-year period of research and development and operating experience, is offered by Combustion Engineering—Superheater, Inc., New York, N. Y. Known as the C-E Recirculation Steam Generator, it is actually a complete steam plant which includes feedwater pump and control, fuel equipment and control, combustion control and safety devices, forced-draft fan, safety valves, circulating pump and all other auxiliaries. The generator may be fired by light or heavy fuel oil or by natural gas. It is available in several sizes for steam capacities from 2800 up to 6000 lb per hr and for operating pressures up to 300 lb per sq in.



Railroad—The generator was originally developed for train heating service. *Industrial*—Following the successful development and application to train heating, the possibilities of the generator for industrial and institutional fields were investigated. The initial applications in industrial and institutional plants were made early in 1950. These were highly successful and since then a number of generators have been purchased for such various types of service as space heating; processing of tobacco, chemicals, cotton fabric, asphalt, dairy products and paper products; space heating in a central station when utility boilers are not operating; process steam for pickling vats, vulcanizing rubber and plating die castings; and heating stills.



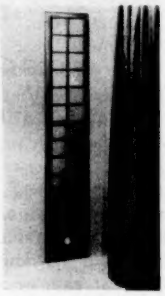
Most notable feature of the generator is its compactness. The 6,000-lb capacity unit for burning light oil or gas occupies a space about 7 ft x 5½ ft x 7 ft, and the heavy oil burning unit is only slightly larger.

The feature that distinguishes this generator from all other types of small steam generators is the use of the controlled recirculation principle. The high rate of heat transfer made possible by the use of this principle permits maximum steam production per unit of heating surface and thus makes possible maximum steam output per unit of space and weight. Moreover, controlled recirculation assures positive circulation throughout all heating surfaces, virtually eliminates scale formation and permits higher operating efficiency.

For more information, circle on Inquiry Card, **Item 16**

Electric Panel for Bathrooms

The Electriglas Radiant Heat Hi-Panel, designed for the bathroom, has been introduced by Appleman Glass Works, Bergenfield, N. J. Nearly 5 ft high and 10¼ inches wide, the panel is recessed into the wall and is particularly adaptable to the usually limited wall areas in bathrooms. Fully-automatic in operation, the panel is available with built-in thermostat.

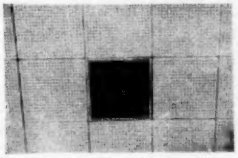


The panel is for either 110 or 220 volts, 1000 watts, 3413 Btu per hour. The surface of the glass reaches approximately 300 deg. The unit consists of two glass panels encased in a frame with silver-hammered finish.

For more information, circle on Inquiry Card, **Item 17**

Outlet Matches Acoustical Tile

The Uni-Flow square ceiling outlet has been introduced by Barber-Colman Co., Rockford, Ill. This outlet is designed and sized to match standard acoustical tile and blends with the ceiling pattern (see illustration). Another model of the same outlet has a surface flange, making it suitable for installation in plaster ceilings.



A feature of the outlet is that the air supply can be adjusted from vertical to horizontal after installation and can be set to discharge air in one, two, or three directions or to provide full 360-degree distribution. None of these adjustments in any way alter the outward appearance of the unit and, without modification, it can be used as a return air opening. A variety of finishes are available to match installation surroundings.

For more information, circle on Inquiry Card, **Item 18**

Compact Air Velocity Meter

The Agitair meter, a battery-powered air velocity measuring instrument, designed for heating, ventilating and air conditioning engineers, is being marketed by Air Devices Inc., New York, N. Y.

Based on the hot thermopile principle, the instrument gives accurate instantaneous measurement of air velocities as low as 5 ft per min and as high as 4,000 ft per min., with static pressure readings from 0 to 4 inches water gage. Compact and light in weight, it can easily be carried from site to site.

For more information, circle on Inquiry Card, **Item 19**

Industrial Humidifying Unit

The Impsco industrial humidifier has been introduced by Industrial Materials Purchasers Co., New York, N. Y. Of the atomizing type, it requires only a water feed-line and connection to an electrical circuit. The only part requiring regular replacement is the glass filter over the air intake and this is standard size.

The humidifier has a capacity of one gallon per hour, weighs about 50 lb, and is 12 x 14 x 22 inches. Vapor is emitted in one direction. Motor is ¼ hp, 110-volt, 60-cycle.

For more information, circle on Inquiry Card, **Item 20**

CO_2 Test in 20 Seconds

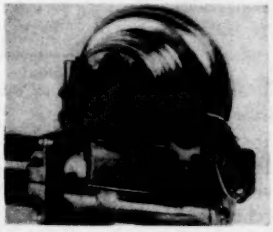
An easily operated CO_2 indicator is now being marketed by F. W. Dwyer Mfg. Co., Chicago, Ill., known as the Dwyer transparent CO_2 indicator. One of the features of this indicator is the fact that it takes but 20 seconds to make a complete test, and over 500 tests can be made per refill.

The body of this indicator is fabricated from transparent solid lucite bar stock, making it practically unbreakable. It has an open-faced dial which can be read easily. Each indicator is furnished with a circular efficiency slide-rule. It is available in a heavy metal case with provision for stack thermometer, draft gage and smoke tester.

For more information, circle on Inquiry Card, **Item 21**

Delayed Opening Oil Valve

A new valve which is said to improve materially the efficiency of oil burners is announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Called the delayed oil valve, it eliminates most causes of sooting in oil-fired heating plants and can be installed easily on most existing and all new high-pressure burners.



In operation the valve holds up the flow of oil to the burner nozzle until the proper air supply is available. As a result, the valve eliminates starting puffs, prevents serious carbon formations on the nozzle and electrodes and provides positive, dripless starts and stops of the fuel supply.

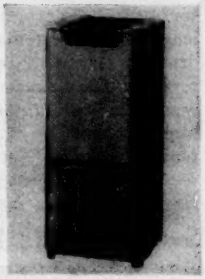
The valve incorporates an electric resistor which delays opening of the solenoid valve for about four seconds after the burner motor starts. This delay permits the burner fan to get up to speed before oil is discharged through the nozzle. As a result, the valve makes possible a clean fire start so that carbon deposits are held to a minimum.

The valve can be installed at any point between the fuel pump and the burner nozzle in a few minutes. Because the solenoid is spring loaded, the valve can be mounted in any position, and will close instantly in the event of power failure. It lists for $9.70.

For more information, circle on Inquiry Card, **Item 22**

Portable Dehumidifying Unit

The Moisture Magnet, a portable electric dehumidifier for home and commercial use, is now being produced by Remington Corp., Auburn, N. Y. It is designed for damp basements, storerooms, gun rooms, locker rooms, paint drying, printing shops, and wherever protection is desired from dampness, mould, mildew and corrosion. It removes 14 pints of water every 24 hours from room air at 80 deg and 79% relative humidity.

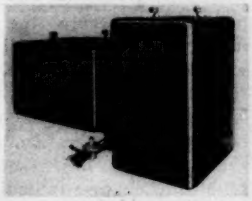


Installation consists merely of plugging the unit into a 115 volt, single phase, 60 cycle outlet. A Du-Flo fan draws the moist air over refrigerated coils, then expels dry, reheated air into the room. The water falls into a rustproof 8-quart receptacle. The refrigerating unit is hermetically sealed with a lifetime supply of refrigerant and oil. The dehumidifier is 30½ x 13 x 13 inches over-all, and weighs 56 lb.

For more information, circle on Inquiry Card, **Item 23**

Blower Type Gas Unit Heater

A gas-fired blower type unit heater was displayed by Surface Combustion Corp., Toledo, Ohio, at the 10th International Heating and Ventilating Exposition in Philadelphia. This unit, AGA approved and designated as Model BCC-05, is intended for applications where it is necessary to deliver air at higher velocities than possible with propeller type fans and to deliver heated air through ducts. Typical installations are in industrial buildings and commercial establishments.

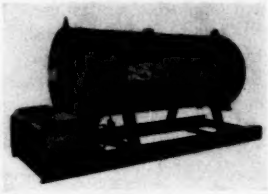


The units are available in six sizes, with capacities ranging from 68,000 to 373,500 Btu per hour output, vented. They are available for all gases, including liquefied petroleum.

For more information, circle on Inquiry Card, **Item 24**

Packaged Steam Generators

A 1951 line of Steam-Pak packaged steam generators, using gas, oil or combination of gas and oil, has been announced by York-Shipley, Inc., York, Pa., and featuring new combustion chamber design for all models from 15 to 250 hp. In the new models the flame swirls in a circular motion through the combustion chamber, providing greater heat transfer. The swirling flame action is created by blowing excess air into the chamber around the burner. This swirling action speeds the flow of gases through the boiler, and forms a protective circle of preheated air around the flame.

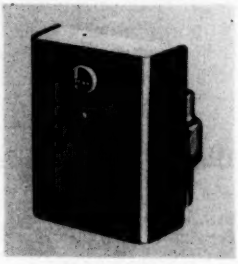


At the center of the combustion chamber is a factory-adjusted carborundum ring which regulates the length of the circulating flame by squeezing it and drawing excess air into the center. This flame action produces complete combustion of all gases before they reach the bank of tubes. Result of the new design is higher combustion efficiency with maximum heat transfer and more efficient boiler output.

For more information, circle on Inquiry Card, **Item 25**

Switch Holds Fixed Flow Rate

The Type 60 Flow Switch, for garbage disposal units and similar applications, is announced by Penn Electric Switch Co., Goshen, Ind. This switch is designed to control an electric circuit on applications requiring the flow of a predetermined amount of any liquid which is not detrimental to yellow brass casting, aluminum bronze, copper or rubber compounds. The switch closes a single pole, single throw contact on increase of liquid flow. A typical application is the control of a garbage disposal unit, where the motor must not start until a predetermined amount of water is flowing through the unit, and must stop when the flow decreases to a preselected rate.



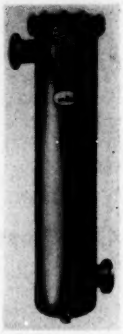
A minimum liquid pressure of 10 lb per square inch is required for operation. Switch will withstand pressures up to 150 lb per square inch. Settings are not affected by changes in liquid line pressure. The switch has Magneseals (sealed contact units) which are easily replaced in the field if damaged because of abnormal load conditions. Brass body is furnished with ½ inch female inlet and outlet connections. The flow range closing point setting can be factory adjusted, from 1¾ to 2½ gallons per minute. Contacts open when liquid flow is decreased approximately ½ gallon per minute below the closing point.

Bulletin 2891 gives complete electrical specifications, roughing-in dimensions, and illustrates a typical installation.

For more information, circle on Inquiry Card, **Item 26**

Removes Oil from Air Lines

Continuous removal of petroleum vapor from compressed air and other gases by the Vape-Sorber, a newly developed device, is announced by Selas Corporation of America, Philadelphia, Pa.

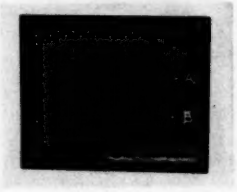


The device is installed in air or gas lines to instruments and critical pneumatic operations where oily air has detrimental effects. In addition to removing petroleum vapor, the unit removes water, free oil, water-oil emulsions and dirt. Liquid-impervious ceramic filters operate in conjunction with specially compounded activated carbon to deliver clean air-gas to operating equipment, with no moving parts.

For more information, circle on Inquiry Card, **Item 27**

Impingement-Strainer Filter

Development of the I-S (impingement-strainer type) air filter to eliminate dust and dirt in central heating, ventilating and air conditioning systems is announced by Glasfloss, New York, N. Y. This filter has the same standard impingement filter pad as the company's regular line (as shown in *A* of the photo) to which is added a bonded industrial mat (see *B*) placed on the down stream side of the filter.



In addition to spray-booth applications, the filter is useful for food processing plants, pharmaceutical and soap manufacturers, television studios, restaurants and dining rooms, hospitals, schools and all public buildings and institutions; in fact, anywhere in the industrial and business world where clean air is important.

For more information, circle on Inquiry Card, **Item 28**

Safety Relief Valve

An item appeared on these pages in the February, 1951 issue, Item 37, describing The Beaton & Cadwell Mfg. Co., New Britain, Conn., No. 300 safety relief valve. This was incorrectly headed as a steam safety relief valve, since its capacity was given in terms of steam relief per hour. However, the valve is actually intended for hot water system runaway boilers or for taking care of any other dangerous high pressure which may occur in the heating system.

For more information, circle on Inquiry Card, **Item 29**

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**
- **New Catalogs**

Circle the Item Number in which you are interested and print clearly your name and address with title.

NEW CATALOGS

LINE OF METAL BELLOWS

A 16-page catalog, No. CMH-113, describing the full line of Flexon bellows as manufactured by Chicago Metal Hose Corp., Maywood, Ill., is available. These bellows are manufactured of brass, stainless steel, bronze, monel, and inconel in single and multiple ply construction and in various lengths, dependent upon the application requirements. They are specially suited for applications of control devices and instrumentation; such as regulators, valves, steam traps, shaft seals, expansion connections and flexible connectors for misalignment. .....Item 30

DIRECT-FIRED HEATERS

Publication of Bulletin 526 is announced by Dravo Corp., Pittsburgh, Pa., describing Counterflo direct-fired space heaters in a range of gas- or oil-fired models with outputs from 400,000 to 2,000,000 Btu per hour. Highlighted in the bulletin is a comparison chart showing that steel requirements for the installation of these heaters is substantially less than that of other commonly used systems. .....Item 31

PACKAGED COOLERS and CONDENSERS

A bulletin has been released by Typhoon Air Conditioning Co., Inc., Brooklyn, N. Y., covering complete specifications, pictures, and special features of all of the company's packaged air conditioning models from 1½ to 20 tons, as well as data and photographs on its evaporative condensers, which run from 3 to 20 tons. Specifications and ratings for each size are shown, as well as diagrams illustrating outside dimensions and general arrangement of the components. .....Item 32

FURNACE PIPE AND FITTINGS

A 44-page catalog, No. 404, Milcor Standardized Furnace Pipe, Gravity and Forced Air Fittings, Stove Pipe and Elbows, has been published by Inland Steel Products Co., Milwaukee, Wis. It contains product specifications, applications, prices, shipping and packaging data on a number of lines, including: galvanized wall stack and accessories; galvanized furnace pipe and accessories; registers, grilles and regulators; stove pipe and accessories; revolving, spinner and louver-type ventilators; Airtite wood-burning heaters and portable bake ovens. It is profusely illustrated with some 200 photos and drawings, and is completely indexed for ready reference. .....Item 33

ROOM COOLER SELECTOR

The Comfort Selector, an aid to take the guesswork out of selecting room air conditioners to suit the particular needs of each prospective user, has been designed and copyrighted by Herbert L. Laube, president of Remington Corp., Auburn, N. Y. The selector, when set to room size, construction and exposure conditions, will show the model of Remington air conditioner to be used. Information required for use of the selector is floor area of the room to be conditioned; whether window area is less or more than one-third the exterior wall area; location of the room; construction; and whether or not the room is insulated. The selector is available to dealers handling Remington air conditioners. .....Item 34

FLOW CONTROL VALVES

Form M-850 has been issued by H. A. Thrush & Co., Peru, Indiana, and covering its line of air eliminating flow control valves, available in vertical type with air vent tube, and in angle types with or without tube. Bulletin gives capacity, dimensions, descriptive information, cutaway views and method of application. ..... Item 35

PLANNING AIR CONDITIONING

For the non-technical businessman who wants to look into air conditioning, a 20-page Planning Guide for Commercial Air Conditioning, Booklet B-5159, has been issued by the Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston, Mass. All technical information has been reduced to understandable, down-to-earth terms. The reader is introduced to the five vital functions of air conditioning, then shown the six components needed to do this job. What to expect from an air conditioning system comes next; after that, factors to consider when actually planning a system. Illustrations of each kind of equipment are included. .....Item 36

NON-RETURN VALVE

A new 6-page bulletin, S-2, fully describing its cushioned single-acting non-return valve, is available from Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. This valve automatically opens to cut in a boiler when the boiler pressure equals the header pressure and closes if the boiler pressure drops below the header pressure due, for example, to a burst boiler tube. Three different yoke assemblies on the elbow, angle and globe bodies are featured in detailed drawings, with a complete list of parts. Adaptability, testing, construction, installation, sequence of operation, servicing and specifications are fully described, along with tables showing general dimensions, approximate shipping weight, and general list of materials. This new Golden-Anderson Cushioned Single-Acting Non-Return Valve Bulletin S-2 may be obtained from this publication or from Golden-Anderson Valve Specialty Co., (2105) Keenan Bldg., Pittsburgh 22, Pa. .....Item 37

COMBUSTION CONTROL EXAMPLES

Five case histories on combustion control are available from The Hays Corp., Michigan City, Ind. Each report is devoted to a complete discussion of the experience of one company with combustion control. Each includes a description of the problems facing boiler plant personnel before installing control; specific conditions existing at the plant; how the control system operates, together with a discussion of related boiler plant equipment, and results obtained with automatically controlled combustion. All are concerned with boilers producing 16,500 to 80,000 lb of steam per hour. ..Item 38

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FIRE EQUIPMENT

Fire Fighting Equipment is the title of a standard size, 6-page folder published by Wirt & Knox Mfg. Co., Philadelphia, Pa., and describing its hose station equipment, hose and pipe fittings and fire protection cabinet outfits. .....**Item 39**

UNIT HEATERS

Two catalogs on the company's line of unit heaters have been issued by McQuay, Inc., Minneapolis, Minn. Bulletin 760 covers downflow or projection type unit heaters and gives specifications, steam and hot water ratings, roughing-in dimensions and mounting heights for various types of diffusers. Bulletin 322 covers horizontal unit heaters and gives similar information, including application data. ..... **Item 40**

SAFETY CONTROL FOR COMPRESSORS

A 4-page folder has been published by Safety Head Control Co., Chicago, Ill., and devoted to that company's safety head control for refrigerating compressors. ..... **Item 41**

PIPE LINE FILTER DATA

An 8-page file-size bulletin No. B-1A, which describes, illustrates and gives applications and specifications for 75 pipe line filters, including pressure and vacuum types, is issued by Dollinger Corp., Rochester, N. Y. The Staynew double-action principle, which provides both mechanical separation and filtration, is featured. A deflector cup directs the flow of air or gas together with entrained water and other foreign matter to the walls of the filter housing, and thence downward at high velocity to the base. Here the water, oil and heavier particles of rust, scale, dust and other dirt are deposited and can be drained off when necessary. The air or gas, having been thus mechanically cleaned, rises at lowered velocity through the insert which removes the lighter air-borne material by positive filtration. Installation views and specifications are included in the bulletin. ..... **Item 42**

HEAT TRANSFER CATALOG

A 4-page condensed catalog No. 10, showing representative items in its line of heat transfer equipment, blenders and process vessels, such as kettles, mixers, and autoclaves, has been issued by Patterson-Kelley Company, Inc., East Stroudsburg, Pa. Essentially, it is an illustrated index of P-K equipment. Complete catalog details are available for all of the items listed. .....**Item 43**

MODULATING CONTROLS

An application folder on its modulating controls has been issued by Fulton Sylphon Division, Robertshaw-Fulton Controls Co., Knoxville, Tenn. Drawings of the numerous types of regulators are shown, together with a large number of application drawings indicating where the control is used in connection with unit heaters, individual radiators or zone control and for solving a wide variety of miscellaneous heating, ventilating and cooling problems. .....**Item 44**

USES OF "WET" WATER

The story on wet water and its possibilities for industry has been published by Aquadyne Corp., New York, N. Y., in a pamphlet entitled Wet Water—what it is and what it can do for you. It is a layman's description of the current industrial applications of wet water and the Aquadyne system of making an economic supply available without elaborate equipment. .....**Item 45**

STEAM-WATER DIFFUSER

A new catalog sheet of O'Brien Steam Specialty Co., Inc., Syracuse 2, N. Y., illustrates and describes the company's all-bronze diffuser, designed for mixing steam and water to produce hot water, and available in 1 and 1½ inch I.P.S. .....**Item 46**

GENERAL PURPOSE PUMPS

Describing and illustrating its broad line of general purpose pumps, a new pump bulletin, B-2300, has just been published by Peerless Pump Division, Food Machinery and Chemical Corp., Los Angeles, Calif., and comprehensively covering the company's horizontal Fluidyne pump line. These are of the horizontal, end-suction centrifugal type and may be driven by electric motors in sizes from ¼ to 150 hp, affording a capacity range from 10 to 5,500 gallons per minute. Liquids can be pumped against heads up to 260 feet. Two types of pumps are offered in the line. One is a close-coupled electric motor driven pump, the other a bracket-mounted pump for driving through a flexible coupling. .....**Item 47**

LIQUID LEVEL CONTROL

Bulletin 1100 has been issued by Automatic Control Co., St. Paul, Minn., and devoted to its line of Autocon Tanktrols of twin bellows design. These are pressure operated pump controls that automatically maintain water levels in elevated tanks. Two bellows are used, one being for high level control and one for low level control. .....**Item 48**

3000 DEG. FIRE BRICK

A 4-page illustrated folder has been published by Johns-Manville, New York, N. Y., entitled JM-3000 Insulating Fire Brick. It presents the economic advantages, industrial applications and refractory properties of this product, the first insulating fire brick for sustained use at 3000 deg F. Physical and thermal characteristics are given in table form. An illustrated description highlights the use of these insulating fire brick in the construction of a slot type forging furnace. The folder also contains summarized information on accessory materials and other insulating brick made by the company. ..... **Item 49**

PAINT COMBATS CORROSION

Publication of a technical bulletin, of interest where maintenance of metal is a serious and costly problem, is announced by McCormack-Medl Corp., Bristol, Pa. It describes the use of Rustorize, a system of protective painting over rusty metal surfaces without sandblasting or other expensive rust removing methods. It covers the problems of painting over rusty steel, tinplate, galvanized iron and aluminum.....**Item 50**

AIR MOVING EQUIPMENT

The 1951 edition of How to Have Comfort from Moving Air, published by Torrington Manufacturing Co., Torrington, Conn., is intended to serve as a buying guide, reference work, and manual. The 180 pages are divided into 23 different classifications of air moving equipment, such as air circulators, kitchen fans, roof ventilators, central heating systems, oil burners, room air conditioners, etc. Each section opens with a short article explaining the use, installation and results to be achieved from the equipment and then it catalogs the products of the various manufacturers, totaling 113, making the equipment. It is plastic bound and very well illustrated by photographs and drawings.....**Item 51**

CEILING AIR DIFFUSERS

A 26-page booklet entitled Ceiling Architecture has been published by Anemostat Corporation of America, New York, N. Y. Although the purpose of the booklet is to show how to fit ceiling air diffusers to the ceiling design, a great deal of other valuable information regarding ceilings is attractively presented, including discussions on acoustics, lighting, and color of ceilings, together with wash drawings showing how air diffusers for the ceiling have been treated in offices, theaters, schools, stores, industrial, residential and other applications. Also included is a series of nine sketches on how to install Anemostat diffusers in ceilings. ..... **Item 52**

CONDENSING HEATING CATALOG

A 20-page condensed general catalog, No. 586, of heating products for homes, stores, institutions and industrial plants has been published by The National Radiator Co., Johnstown, Pa. It contains all essential descriptive information on National heating products, such as ratings, capacities, inputs and outputs, roughing-in dimensions and domestic hot water heater recoveries. Among the products illustrated and described are cast iron boilers for oil, coal, gas or stoker firing; steel boilers for coal, gas or oil firing; gas boilers; convectors and their enclosures; cast iron radiation; baseboard heating units, domestic water heaters, and horizontal and down flow unit heaters. .....**Item 53**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53							

PLEASE PRINT Apr. H/51

Name.....

Title.....

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Street.....

City..... Zone..... State.....

This card is void after July 1, 1951

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conditioner Improves Windowless Office Air

PROBLEM: In a windowless inner office, 9225 cu ft of air was recirculated 7.8 times per hour to supply each of ten occupants with 120 cfm of cooled air. With no outside air intake, quality of the recirculated air had to be maintained.

SOLUTION: Two activated carbon air recovery panels supplied by W. B. Connor Engineering Corp. were installed on the return air entrance of the three-ton capacity room conditioner serving the room. These panels contact 20% of the total air (1200 cfm) circulated by the unit. Thus 240 cfm or 24 cfm per person are treated by activated carbon.

RESULTS: With no outside air intake, good air quality or freshness is maintained.

Climate Changer Keeps Chicks Comfortable

PROBLEM: At Welp's Hatchery, Bancroft, Iowa, a new building to house a chick starting room and chick batteries was planned so that close tolerances of temperature and ventilation could be met. J. H. Welp, owner of the business, told engineers "Our chief problem always has been to properly heat the air brought into the chick rooms and still give the rooms proper ventilation. Also, we have had trouble in the chick batteries because of the variation of temperature between the bottom tray and the top, a distance of a little over 6 ft." In his new building he needed a ventilation system that could take in 100% outside air at the rate of 1 to 1½ air changes per hour, and, to lessen chick mortality, there had to be a very exacting control of humidity.

SOLUTION: Trane SD coils, scientifically designed to prevent freezing, handles the cold outside air of northern Iowa without trouble. Trane steam heat grid humidifiers and reheat coils are in the air supply duct to each room where they maintain a constant humidity of 40 to 50%. Air is distributed through ceiling diffusers and is exhausted by fans from the floor area. Floor drafts are detrimental to chicks in the starting batteries. To overcome this, coils were placed in the concrete floor and 120F water is circulated to maintain a floor surface temperature of about 85F.

RESULTS: Chicks are kept comfortable at all times. Mortality is greatly reduced. Temperature gradient from floor to ceiling is very slight. Adequate ventilation air is provided without drafts.

Unit Heaters Handle Largest Airport

PROBLEM: At the General Louis E. Boutwell Building at Logan International Airport, Boston, Mass., the world's largest airport passenger terminal was designed to require 9.25 million Btu per hr. The building overlooks the North Atlantic Ocean, has 160,000 sq ft of floor and 20,000 panes of glass. A continuous corridor 3,053 ft long has one wall entirely made of glass.

SOLUTION: The building is heated by 104 Herman Nelson unit heaters. Sixty vertical shaft propeller fan type unit heaters heat the long corridor. Each delivers 1,120 cfm and 93,950 Btu per hour. Sixteen large loading area doors are blanketed by 32 cabinet type unit heaters. Each is operated by a remote bulb gradual acting temperature controller.

RESULTS: Thermostatically controlled to take advantage of the sun effect on the large glass area, the 104 unit heaters have been heating the building uniformly and economically for 18 months. All heaters are readily accessible for maintenance and require no floor space.

Air Conditioning Cost Less Than Ventilation

PROBLEM: The shipping room in the Pioneer Suspender Company plant in Darby, Pa., was situated over a basement boiler room, has three walls of glass, and is divided into aisles by steel stock bins which hinder air circulation. Floor temperatures in the 9,000 square foot room ran as high as 125F, due to heat from boilers below.

SOLUTION: Preliminary ventilating estimates called for multiple intake as well as exhaust fans to move sufficient air to produce satisfactory working conditions. Further calculations showed that an air conditioning system using a 30-ton refrigerated Kooler-Aire could be installed to provide comfort cooling at a cost considerably below the estimate of ventilation. As designed and installed by Air Conditioning Associates,

Inc., the system places the compact unit in an adjacent equipment room with duct work connecting to the shipping room. Air distribution is provided by a grille at each of the aisles. The system uses 15% outside air obtained through a short duct run from the rear outside wall of the building.

RESULTS: The system provides a complete change of air every hour and uses 12 tons of cooling to overcome the extreme heat load at the floor. Working conditions are made comfortable at a cost lower than would be required for ventilation alone.

Glassheat Used in Chick Brooder

PROBLEM: In very cold climates, chicks must be protected against cold ambient air, while adequate ventilation is provided.

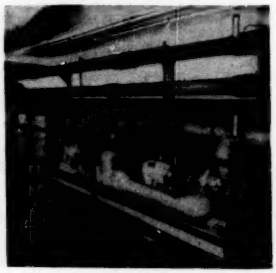
SOLUTION: Glassheat has been used successfully in raising baby chicks on several farms in various parts of the country. In a brooding experiment at Purdue University, Dr. J. Holmes Martin found that the chicks stayed warm and healthy under a radiant heated screen suspended over them. The temperature under the screen was 60F, while a few inches away it was —5F. Similar work has been carried on at Michigan State Agricultural School.

RESULTS: Baby chicks under radiant brooders grow pin feathers more quickly and are less subject to diseases than chicks under conventional hovers.

Vapor Proofing Saves Cold Line Insulation

PROBLEM: Three parallel cold water lines at the William Penn Hotel in Pittsburgh required frequent servicing and replacement of insulation because of condensation of moisture on pipe surfaces and in insulation spaces.

SOLUTION: The pipes have been thoroughly insulated and carefully vapor proofed. All three lines are covered with 1½-inch mineral wool sectional pipe insulation. Fittings are covered with mineral wool felt and insulating cement. The inside surfaces of sectional insulation were coated with asphalt emulsion and pressed on the pipe. Adjoining sections were butted together and spirally wound with jute twine on 4-inch centers. Wax-impregnated paper was then wrapped around the insulation with edges lapped 3 inches and sealed with asphalt emulsion. Rosin-sized paper was wrapped and sealed over the wax wrapper. Eight-ounce canvas was pasted over the rosin-sized paper and two coats of oil paint applied to finish the installation.



RESULTS: Condensation of moisture on piping is prevented. Renewal of insulation and replacement of corroded pipe is reduced.

Dehumidifiers Dry Soaked Library Books

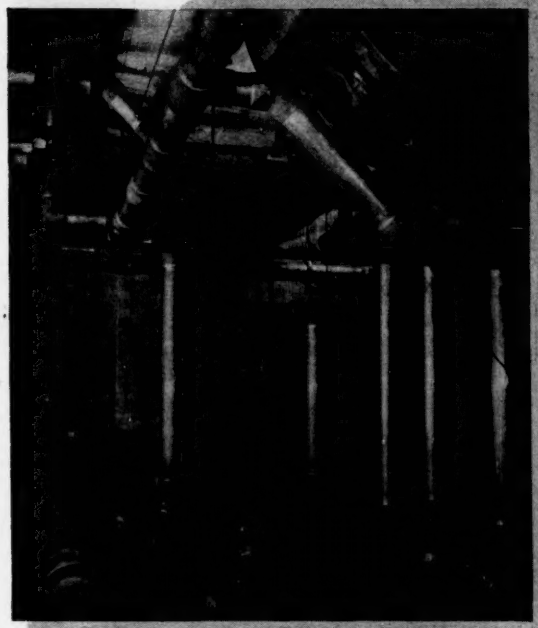
PROBLEM: Following a disastrous $5,000,000 State Office Building fire, during which thousands of tons of water cascaded down through unburned portions of the structure, almost 500,000 volumes in the Michigan State Library were in danger of being badly soaked. Some of the books began to swell in the abnormally high humidity and were threatened with mildew and destruction of the binding. Relative humidity in the library two days after the fire started was 82%.

SOLUTION: Alvin Kremer, keeper of records at the Library of Congress at Washington, advised immediate dehumidification. Lansing's Carrier dealer, the Garlock Sales Co., installed 16 refrigerating coils, four on each of the four levels of book stacks. Three reciprocating compressors were attached to the coils and the equipment operated around the clock by lowering and controlling the temperature. A 15-ton Carrier cold diffuser, which had been installed earlier in the State Prison at nearby Jackson, was borrowed back and installed in the reading room of the library. Twelve portable 1/3-hp Humidry units, designed to keep home basements and storage spaces dry, were installed in the partially flooded traveling library in the basement of the State Office Building and in an upstairs vault.

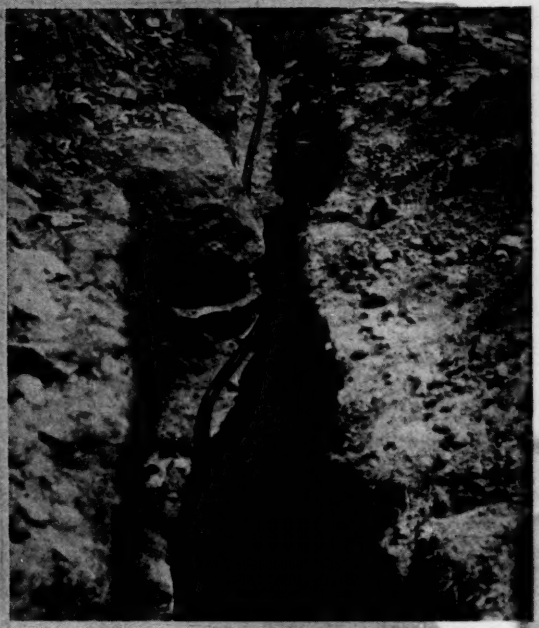
RESULTS: During the first week more than 500 gallons of water were removed from the air in the library. Books which had swollen so tight in the shelves that they could not be removed, gradually returned to normal size. After two weeks of operation, the relative humidity in the library, which at one time had been 85%, had been pulled down to 29% while the temperature had been raised from 50 to 80F.

HEATING AND VENTILATING will pay for acceptable Product Application stories of new, unusual, or ingenious uses of equipment or materials sent to this magazine exclusively. Items should be about the length of those in this month's issue and should be illustrated if possible. Payment is on publication. Send to Editor, Heating and Ventilating, 148 Lafayette Street, New York 13, N. Y.

Now, it makes more sense than ever to use...



ONE VITAL SPOT where Revere Copper Tube can be used is in the conveying of liquids in industrial processing. Here is just the place for Revere Copper Tube to show its true worth. For it is non-rusting and will resist the corrosive action encountered in many of the process applications.



UNDERGROUND Revere Copper Water Tube resists the corrosive action of water inside and that of the soil on the outside. It can be bent around obstructions; made to follow the contours of the ground. Its long sections, which may be had in coils, are easier to handle, require fewer fittings.

COPPER
WHERE IT COUNTS!

USING Revere Copper in the vital spots has always made common sense. Now, with copper restricted for some uses and limited for others, it becomes even more important to use "Copper Where It Counts!"

Three of these places are: industrial process lines, underground service lines and for domestic hot and cold water lines. Revere Copper Water Tube can be used for these purposes. So, whether you are a contractor, engineer or builder it will pay you to specify and use what copper you *can* get where it will do you and your customers the most good. That means in the spots where rustable materials can't stand the gaff.

Revere Copper Tube is non-rusting, has high corrosion resistance, is easily worked, installation costs are no more than for short-lived materials. It is joined with solder or compression fittings. Revere Copper Tube is ideal for replacement as it is readily bent, requires fewer fittings. It is available in hard and soft tempers, in straight lengths; also in 60′ coils in soft temper. Each length is marked with the name Revere. Look for this mark. It assures uniform quality.

To maintain your reputation for top-quality jobs, while metals remain short, use Revere Copper Water Tube wherever you can. The Revere Technical Advisory Service will be glad to help you in every way possible. Avail yourself of this service through your Revere Distributor. Call him today.

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DEGREE-DAYS FOR FEBRUARY, 1951

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 23rd Year of Publication of Monthly Degree-Day Data

City	February			Cumulative, September 1 to February 28			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Abilene, Texas (A)	425	340	510	2053	1751	1761	2061
Albany, New York (A)	1057	1241	1142	4781	4773	4868	6580
Albuquerque, New Mexico (A)	699	560	692	2812	3085	3443	4298
Alpena, Michigan (C)	1194	1216	1278	5441	5201	5660	8299*
Anaconda, Montana (C)	1072	1001	1164	5609	5754	5656	8357**
Asheville, North Carolina (C)	654	585	756	3246	2523	3276	4232
Atlanta, Georgia (C)	484	394	557	2405	1769	2370	2890
Atlantic City, New Jersey (C)	766	774	904	3175	2840	3631	5176
Augusta, Georgia (A)	448	315	423	2201	1311	1864	2161
Baker, Oregon (C)	928	940	991	4526	5025	5024	7163
Baltimore, Maryland (C)	749	765	798	3154	2688	3462	4533
Billings, Montana (A)	1041	865	1120	5131	5482	5254	7119
Binghamton, New York (C)	1004	1092	1182	4522	4292	4965	6808
Birmingham, Alabama (A)	447	354	521	2355	1614	2023	2352
Bismarck, North Dakota (A)	1517	1599	1548	7090	7338	6869	9192
Block Island, Rhode Island (A)	830	931	983	3457	3314	3767	5788
Boise, Idaho (A)	783	827	848	3839	4379	4230	5552
Boston, Massachusetts (A)	841	1029	1042	3641	3766	4322	6045
Bozeman, Montana (C)	1120	975	1208	5872	5638	5897	8521**
Buffalo, New York (A)	1045	1117	1156	4593	4316	4768	6822
Burlington, Iowa (A)	1039	1062	(a)	4955	4415	(a)	(a)
Burlington, Vermont (A)	1186	1338	1294	5219	5243	5496	7514
Butte, Montana (C)	1132	1059	1143	5939	5986	5635	8235**
Cairo, Illinois (C)	685	629	762	3220	2574	3169	3909
Canton, New York (C)	(a)	1383	1328	(a)	5416	5842	8020
Charleston, South Carolina (C)	390	234	372	1741	969	1491	1769
Charlotte, North Carolina (C)	528	462	588	2547	1948	2533	3120
Chattanooga, Tennessee (A)	527	479	602	2733	2112	2559	3118
Cheyenne, Wyoming (A)	950	870	1075	4787	4774	5179	7466
Chicago, Illinois (C)	1007	1012	1039	4544	4014	4401	6077
Cincinnati, Ohio (C)	797	759	862	3645	2928	3675	4684
Cleveland, Ohio (A)	976	996	1075	4438	3939	4441	6155
Columbia, Missouri (A)	844	800	800	3923	3421	3903	4922
Columbia, South Carolina (C)	426	347	498	2114	1473	2000	2364
Columbus, Ohio (C)	907	882	980	4135	3463	4113	5398
Concord, New Hampshire (A)	1048	1292	1240	4839	5154	5321	7353
Concordia, Kansas (C)	867	854	970	4019	3928	4173	5315
Dallas, Texas (A)	423	334	493	1918	1624	1980	2256
Davenport, Iowa (C)	1061	1092	1140	4926	4403	4825	6289
Dayton, Ohio (A)	970	932	980	4508	3787	4043	5264
Deer Lodge, Montana (C)	1046	999	1175	5828	5864	6069	8672**
Denver, Colorado (C)	866	681	918	4024	3595	4273	5874
Des Moines, Iowa (A)	1101	1145	1173	5066	4697	4935	6384
Detroit, Michigan (A)	1038	1070	1134	4643	4294	4718	6490
Devils Lake, North Dakota (C)	1593	1696	1551	7655	7920	7371	9970
Dodge City, Kansas (A)	756	714	890	3713	3549	3958	5035
Dubuque, Iowa (C)	1200	1159	1218	5377	4873	5194	6790
Duluth, Minnesota (C)	1407	1389	1464	6949	6702	6680	9483
Eastport, Maine (C)	1045	1262	1232	4717	4981	5502	8520**
Elkins, West Virginia (A)	875	856	991	4328	3692	4256	5697
El Paso, Texas (A)	480	320	434	1893	1873	2101	2428
Ely, Nevada (A)	922	889	(a)	4587	5129	(a)	(a)
Erie, Pennsylvania (C)	966	1003	1098	4244	3804	4434	6273
Escanaba, Michigan (C)	1283	1318	1340	5951	5763	6028	8771
Evansville, Indiana (A)	815	737	854	3794	3053	3348	4244
Fort Smith, Arkansas (A)	565	505	630	2763	2382	2657	3147
Fort Wayne, Indiana (A)	1043	1052	1098	4821	4233	4503	5925
Fort Worth, Texas (A)	435	335	498	1935	1681	1904	2148
Fresno, California (A)	416	370	389	1704	2080	1883	2334
Galveston, Texas (C)	278	88	255	962	486	983	1016
Grand Junction, Colorado (A)	954	854	863	3980	4330	4374	5548
Grand Rapids, Michigan (A)	1067	1078	1204	4944	4375	4863	6535
Green Bay, Wisconsin (C)	1326	1346	1358	6248	5799	4778	7825
Greensboro, North Carolina (A)	638	628	678	3102	2529	2845	3529
Greenville, South Carolina (A)	543	466	661	2629	2086	2739	3380
Harrisburg, Pennsylvania (A)	877	918	1008	3958	3569	4077	5375
Hartford, Connecticut (A)	906	1068	1100	4081	4144	4751	6036
Hatteras, North Carolina (C)	509	347	535	1953	1249	1851	2571
Havre, Montana (C)	1353	1298	1450	6260	6916	6388	8700
Helena, Montana (A)	1109	952	1178	5848	6191	5611	7894**
Houston, Texas (C)	271	131	277	1048	647	1092	1157
Huron, South Dakota (A)	1157	1360	1340	5995	6151	6075	8004
Indianapolis, Indiana (A)	955	927	969	4473	3740	4099	5298
Jackson, Mississippi (A)	381	271	(a)	1913	1240	(a)	(a)
Kansas City, Missouri (A)	839	821	946	3822	3495	3953	4956
Knoxville, Tennessee (A)	581	526	666	2948	2288	2964	3670
La Crosse, Wisconsin (A)	1292	1370	1265	6071	5798	5578	7322
Lander, Wyoming (A)	1034	930	1155	5224	5429	5666	7947

(a) Data not available.

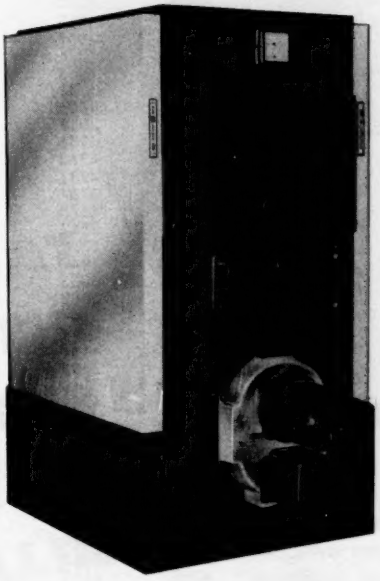
[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 122]

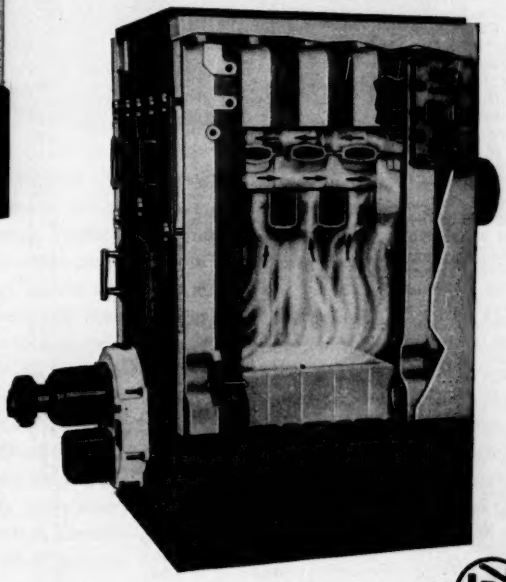
for larger homes
or
small business establishments

H. B. SMITH "2,000" BOILER BURNER UNIT

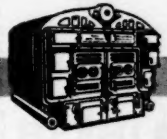


Engineered for high efficiency

Here's an integral boiler burner unit of high efficiency. Based on the famous Mills "20" boiler, it includes an improved oil burner engineered for this specific purpose. Recommend the "2000" for applications requiring net I=B=R steam ratings of 675 to 1275 sq. ft. or equivalent hot water ratings.



Cut-away view shows the sturdy cast iron construction and engineered Mills flue travel which provides fast heat and economical operation. The "2000" is available with flush jacket or with jacket extended to conceal the oil burner. Supplied with large-capacity tankless water heater or built-in storage tank heater. Black and cream enamel finish.



H. B. Smith CAST IRON BOILERS

Reg. U. S. Pat. Off.

The H. B. SMITH CO., INC. • WESTFIELD, MASS.
OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES

Degree-Days for February, 1951 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 23rd Year of Publication of Monthly Degree-Day Data

City	February			Cumulative, September 1 to February 28			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Lansing, Michigan (A)	1110	1146	1201	5083	4731	5202	7048
Lewiston, Maine (O)	1057	1291	1243	4861	5117	5532	7707
Lincoln, Nebraska (C)	933	1005	1131	4496	4405	4643	5999
Little Rock, Arkansas (A)	525	489	582	2560	2057	2380	2811
Livingston, Montana (C)	932	825	1067	4999	5049	5018	7245**
Los Angeles, California (C)	235	228	266	753	1085	1016	1504
Louisville, Kentucky (A)	793	720	801	3646	2882	3327	4180
Lynchburg, Virginia (A)	702	705	730	3315	2737	3143	3980
Macon, Georgia (A)	396	281	462	1960	1274	1908	2201
Madison, Wisconsin (C)	1221	1223	1299	5615	5142	5557	7429
Marquette, Michigan (C)	1267	1271	1361	5843	5738	5915	8693*
Memphis, Tennessee (A)	566	488	599	2706	2099	2470	2950
Meridian, Mississippi (A)	394	287	456	2037	1339	1891	2160
Milwaukee, Wisconsin (A)	(a)	1144	1201	(a)	4868	5185	7245
Minneapolis, Minnesota (A)	1327	1356	1400	6246	5963	5950	7850
Montgomery, Alabama (A)	370	237	392	1926	1080	1676	1884
Nantucket, Massachusetts (A)	827	931	974	3576	3540	3912	5957
Nashville, Tennessee (A)	647	582	675	3119	2433	2850	3507
New Haven, Connecticut (A)	878	994	1011	3887	3839	4230	5895
New Orleans, Louisiana (C)	234	124	230	1047	540	965	1024
New York, N. Y. (C)	790	893	953	3371	3085	3837	5274***
Nome, Alaska† (A)	2226	1603	1990	9994	6221	7226	14580**
Norfolk, Virginia (C)	565	543	650	2399	1857	2583	3350
North Head, Washington (C)	582	626	622	3013	3284	3132	5452**
North Platte, Nebraska (A)	929	935	1020	4580	4695	4806	6366
Oakland, California (A)	396	411	403	1533	2127	2029	3143**
Oklahoma City, Oklahoma (C)	650	530	742	2773	2580	2986	3613
Omaha, Nebraska (A)	1008	1101	1126	4795	4637	4765	6131
Oswego, New York (C)	1079	1140	1162	4651	4428	4933	7088
Parkersburg, W. Virginia (C)	803	769	879	3740	3121	3701	4775
Peoria, Illinois (A)	1033	1062	1067	4829	4267	4673	6109
Philadelphia, Pennsylvania (C)	762	849	881	3286	2949	3542	4737***
Phoenix, Arizona (C)	230	137	263	840	1020	1253	1405
Pittsburgh, Pennsylvania (C)	828	858	944	3985	3324	3947	5235
Pocatello, Idaho (A)	899	968	986	4563	4966	4853	6655
Portland, Maine (A)	1046	1301	1162	4857	5078	5088	7218
Portland, Oregon (C)	559	640	644	2784	3291	3174	4469
Providence, Rhode Island (C)	807	1016	1070	3598	3705	4316	6015
Pueblo, Colorado (A)	829	704	916	3928	3672	4140	5514
Raleigh, North Carolina (C)	545	515	630	2558	1941	2605	3234
Rapid City, South Dakota (A)	1039	976	1119	5083	5350	5140	7118
Reading, Pennsylvania (C)	828	895	980	3653	3344	4082	5389
Red Bluff, California (A)	456	422	(a)	1962	2205	(a)	(a)
Reno, Nevada (A)	795	724	823	3720	4155	4149	5892
Richmond, Virginia (C)	628	645	695	2891	2331	2906	3695
Rochester, New York (A)	1082	1132	1159	4703	4482	4825	6732
Roseburg, Oregon (C)	(a)	(a)	605	(a)	(a)	3090	4428
Roswell, New Mexico (A)	605	461	580	2605	2518	2876	3484
Sacramento, California (C)	402	370	426	1708	2031	2036	2653
St. Joseph, Missouri (A)	921	908	974	4216	3992	4121	5161
St. Louis, Missouri (C)	(a)	771	854	(a)	3066	3652	4585
Salt Lake City, Utah (A)	795	805	885	3856	4268	4144	5555
San Antonio, Texas (A)	419	228	274	1363	915	1128	1202
San Diego, California (A)	258	258	280	829	1107	1099	1645
Sandusky, Ohio (C)	974	966	1061	4324	3737	4384	6208
San Francisco, California (C)	253	360	356	1488	1846	1770	3264**
Sault Ste. Marie, Michigan (A)	1333	1424	1487	6234	6195	6315	9285**
Savannah, Georgia (A)	362	222	316	1742	917	1323	1490
Scranton, Pennsylvania (C)	928	1028	1106	4224	4010	4552	6129
Seattle, Washington (C)	582	604	647	2910	3393	3297	4934**
Sheridan, Wyoming (A)	1003	1025	1160	5196	5653	5789	8008
Shreveport, Louisiana (A)	411	298	412	1882	1368	1736	1938
Sioux City, Iowa (A)	1070	1222	1260	5271	5288	5278	6898
Spokane, Washington (A)	911	980	952	4607	5382	4707	6355
Springfield, Illinois (C)	916	907	1008	4291	3620	4191	5373
Springfield, Missouri (A)	750	719	876	3641	3248	3523	4428
Syracuse, New York (A)	1101	1187	1212	4798	4491	4980	6893
Tacoma, Washington (C)	615	638	675	3138	3587	3438	5181**
Terre Haute, Indiana (A)	918	896	966	4395	3638	3876	4872
Toledo, Ohio (A)	1039	1047	1075	4737	4214	4467	6077
Topeka, Kansas (C)	822	801	935	3792	3628	3953	4969
Trenton, New Jersey (C)	814	905	941	3573	3299	3715	4933
Utica, New York (O)	710	1234	1181	4555	4677	4966	6796
Valentine, Nebraska (C)	1006	1046	1130	5055	5239	4095	7039
Walla Walla, Washington (C)	715	841	778	3416	4150	3676	4808
Washington, D. C. (C)	725	732	848	3130	2636	3559	4626
Wichita, Kansas (A)	757	710	896	3503	3339	3773	4673
Williston, North Dakota (C)	1514	1450	1495	6999	7385	6958	9323
Winnemucca, Nevada (C)	840	905	796	4003	4522	4644	6427**
Yakima, Washington (A)	838	991	846	4321	4904	4433	5599

(a) Data not available.
†Nome data are for January.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.

WHAT IS THE BIGGEST FACTOR IN SELLING A DUCT JOB ?

We strongly suspect that more sales are won or lost by the contractor's answer to the customer's question of "How much?" than by any other single factor. There may be exceptions, where cost is a secondary consideration with the buyer, but those are not the jobs that build big yearly sales volume.

After weighing the cost, the customer usually wants to know about the sheet material to be used. Will it give long service in ductwork? Is it rigid enough to withstand vibration? Will it look good when it is installed? Will it satisfy all technical requirements?

These questions are all easy to answer when you use Bethlehem Galvanized Steel Sheets. Thousands of heating and air-conditioning jobs extending over a period of many years have proved that Bethlehem Sheets have everything that the customer wants. They give long, trouble-free service — and they are priced well below sheets made from other metals.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM GALVANIZED SHEETS

NEWS OF THE MONTH

ALL-WEATHER LABORATORY

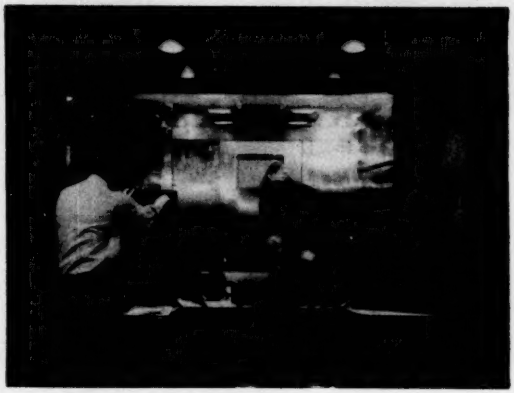
at Dayton, Ohio, has two brine circuits to serve the test chambers.

Weather conditions found anywhere in the world can be produced and altitudes simulated up to 150,000 ft in the Wright-Patterson All-Weather Laboratory, Dayton, Ohio, the only environmental test facility of its size and scope anywhere. The laboratory can test components or parts of airplane under weather conditions encountered in flight. Each of the test cabinets has been designed for a special range of tests. There are special chambers to produce dust storms, salt fog, sunshine, rain and snow. Humidity can be controlled for fungi tests. Temperature can be held from —125 to 250F; relative humidities from 2 to 100%. Within three minutes, temperature can be pulled down from 70F to —70F. Most of the low temperature tests are made at 65-70F.

• **EQUIPMENT.**—To achieve low temperatures, there are three Carrier centrifugal refrigeration machines in series using Freon-12 to chill a methyl chloride brine. Each unit is in three stages with flash coolers between the stages. The system requires 800 hp arranged in stages as follows: 150, 250 and 400 hp. It can circulate 570 gpm brine at —125F.

A total of 47.2 tons refrigeration serves a second circuit to supply 30F brine at a flow of 270 gpm.

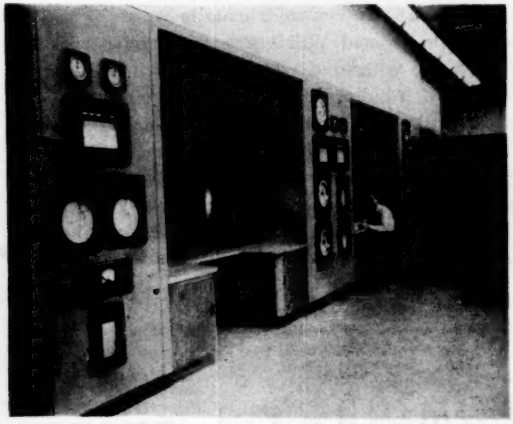
• **BRINE STORAGE.**—The low temperature brine is piped to a 30,000-gallon storage tank of Inconel metal, covered with 12 inches of insulation. Controls are so arranged that the storage tank can carry the entire load for the testing chambers, assist in meeting the load, or it can be recharged while the refrigeration plant is meeting the chamber load demand. Temperature of the brine in the tank is never allowed to rise above —80F.



Looking into low temperature test chamber through eight-pane window.

The refrigeration system was engineered, manufactured and installed by Carrier Corp. The heating, cooling, humidification and dehumidification equipment is operated by Carrier for the Air Force.

This laboratory was completed at a total cost of $6-7 million. It was found during the last war that more material was lost due to lack of understanding of material than in actual warfare.



Photos, USAF Air Materiel Command

Outside view of test chambers showing recording instruments.

COAL PIPELINE

Pittsburgh Consol will build is demonstration aiming at a cheap way to move low-grade coal into the Great Lakes area.

Rising freight rates, particularly on short hauls, are weakening the ancient alliance between the coal and rail industries. Coal companies are looking for other ways to ship besides by rail. Ohio's proposed 130-mi.-long belt conveyor is one solution. Killed by the state legislature two years ago, the plan is being revived.

• **PUMPING COAL.**—An equally radical proposal announced last week by Pittsburgh Consolidation Coal Co. is to pump coal through a pipeline. The company has developed a way to suspend pulverized coal in a mudlike mixture, or slurry, which, when pumped, carries the coal through the line. The coal would be delivered to the customer dried and pulverized or pressed into blocks.

Pittsburgh Consol has already tested out the method in a small pilot line at Library, Pa. Now the company is ready to build a full-scale demonstration job at Cadiz, Ohio. The 12-in. line will be 3 mi. long, cost $550,000. It will be operated continuously and is expected to deliver several thousand tons of coal daily.

NEW Safety and Economy in for Services

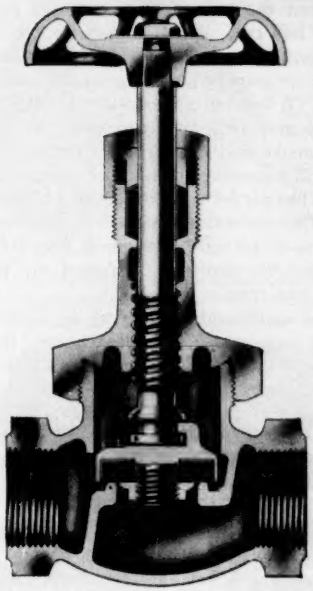


Fig. 506 Bronze Globe
400 lbs. O.W.G. ¼" to 2"

Fig. 507 Bronze Check
400 lbs. O.W.G. ¼" to 2"

Fig. 508 Bronze Angle
400 lbs. O.W.G. ¼" to 2"

APPROVED BY UNDERWRITERS' LABORATORIES,

SPECIAL DESIGN FEATURES

provide high strength and trouble-free, tight closure to meet all tests

EXTRA HEAVY, REINFORCED BODY. Liberally proportioned construction, with reinforcing rib along center line, and heavy lug ends. Will take all ordinary pipe strains without distortion, and provides a factor of safety far above any L.P.G. service needs.

CROWNED SEAT Insures positive tightness required to meet N.B.F.U. test of 500 p.s.i. under seat when valve is closed.

IMPROVED COMPOSITION DISC Meets every test of L.P.G. service. Retains resilience through entire range of liquid and gaseous phases from −50 F. to +150 F.

DEEPER PACKING BOX. Extra deep packing box and spiral, lubricated packing material permits spindle to turn with minimum friction. Dependable seal at this point and at valve seat is assured without excessive effort on handwheel.

BEVELED SPINDLE SHOULDER Back seats against corresponding bevel at bottom of bonnet when valve is full open. Relieves pressure on packing material.

ALL OTHER PARTS SPECIALLY DESIGNED and proportioned to meet rigorous requirements of critical L.P.G. service. Construction features of Fig. 507 Check and Fig. 508 Angle same as Fig. 506 Globe.

Sold Through Leading Distributors Everywhere

Liquified Petroleum Gas (butane-propane), commonly known as "bottle gas", has become a popular domestic fuel, and is now being widely used in industry. Piping systems for handling these gases must be controlled by valves specially designed for this hazardous service.

These new Underwriters' Approved Jenkins Valves for L.P.G. service offer strength and safety well beyond specified requirements. They are built to the same quality standards that make all Jenkins Valves the economy-wise choice for any service.

Where Gate Valves are required for L.P.G. service, Jenkins Fig. 270-U offers the proper ratings.

Because of their superior safety features, Jenkins L.P.G. Valves are also recommended for air, gasoline, oil, and similar services where exceptionally rugged, specially tested valves are needed. For complete details and dimensions, get the new Jenkins L.P.G. Valve folder, Form 197. Use the coupon. Jenkins Bros., 100 Park Ave., New York 17, N. Y.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

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The complete line of JENKINS L.P.G. VALVES are described in this new folder. Mail coupon today.

JENKINS BROS., 100 PARK AVE., NEW YORK 17

Please send L.P.G. Folder—Form 197

Name.....

Company.....

Address.....

At the same time, State Sen. Doland H. Rolf has introduced a bill in the Ohio General Assembly to give public utility status to coal pipelines. If Rolf's bill goes through, Pittsburgh Consol will have the right to condemn private property for right-of-way for a commercial pipeline.

• **LOWER COSTS.**—Economically speaking, Pittsburgh Consol would have plenty of incentive to get a commercial line under way. For one thing, the company is sure from its pilot operation that it could save freight costs on short hauls and offer lower rates to its customers if it used a coal pipeline. Right now, it costs about $2.75 a ton to haul coal by rail less than 125 mi. from southeast Ohio to the big industrial coal market in Cleveland. Yet, it costs only about $4.25 to ship coal the much greater distance from Fairmont, W. Va., to New York City.

• **SUPPLY.**—Moreover, Pittsburgh Consol has accumulated vast reserves of low-quality steam coal in southeastern Ohio. While this cannot command high prices in the special-purpose market, it is very adaptable to powerplant use. And because it comes out of the ground in very small pieces, called "fines," it is ideally suited to pipeline transportation.

• **DEMAND.**—The market for this coal in the Cleveland area should be tremendous—particularly if it could be delivered at a reduced rate by pipeline. Among the potential customers, Cleveland Electric Illuminating Co., big to begin with, has been adding capacity greatly since the war. It would probably jump at the chance to get a steady supply of low-cost steam coal. Ohio Edison, at Akron, and Ohio Power, at Canton, both lie close by a line between Pittsburgh Consol's Georgetown stripmine at Cadiz and Cleveland. Running short extensions to these plants would improve still more the economics of operating a main pipeline from Georgetown to Cleveland.

GAS CLEANER

devised to curb smoke and fly ash is air jet with electronic control; also cuts fuel bills.

A cheaper way of cutting down smoke in city skies has been made public after a number of successful installations.

• **JET.**—A combination of electronic controls and a jet of air are the essentials. Smoke and fly ash are waylaid in the furnace before getting out into the air. A side effect is that the fuel is more completely consumed, with consequent savings.

Power engineers in industries, public utilities, schools and public buildings frequently are accused of causing a nuisance with smoking chimneys. For them, as well as for city dwellers who breathe smoke-polluted air and particularly housewives who hang out wash, the invention sounded like good news.

• **INVENTOR.**—It was devised by Walter C. Gaumer, superintendent of power for Keystone Steel and Wire Company of Peoria for a dozen years.

His company, like many others, was under constant urging from city authorities to keep smoke and fly ash out of the air. Devices in use elsewhere, such as steam or chemical precipitators, seemed costly, noisy and complicated, so he set to experimenting with the problem on a new tack.

He ended up by not only removing the fly ash but also by cutting down the amount of slag in the furnace and by using less fuel.

Mr. Gaumer's smoke eater consists of two sections. A photoelectric cell measures the density of the smoke leaving the stack. When an undesirable density is reached, an air jet goes into operation over the fire bed, blasting the smoke and ash particles out of the chimney exhaust and returning them to the firebox for complete burning. The air jet is produced by a blower.

From tests, Mr. Gaumer estimates his device reduces fly ash by as much as 95 percent. It saves on fuel bills, he explains, because the addition of forced air increases turbulence and creates more heat.

"Because of the additional heat, fuel is burned better and less is required. Consequently, less impurities remain to go out of the stack as fly ash," he says.

• **COST.**—Installations at Woodruff and Peoria High Schools were made at a cost of about $200 each, he relates. They were built by Otto Torbe, Jr., a student at baseketball-famed Bradley University, who works on the school's maintenance crew.

Other available types would have cost upward of $2,000, declares the inventor. He says his device is not patented and not being manufactured for sale, since only a "use" patent could be obtained. Thus anyone could build similar equipment, working drawings for which are available, he adds.

FUEL RESOURCES

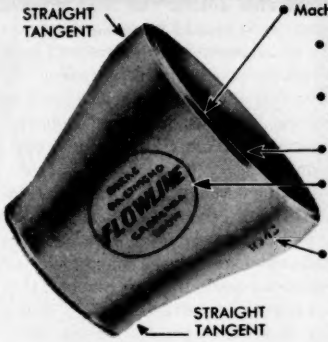
of the United States reviewed in annual report of the Secretary of the Interior.

In the 1950 Annual Report of the Secretary of the Interior, Secretary Chapman dwelt at some length on the resources of the nation in our expanding economy. In discussing fuel utilization and conservation, the Secretary commented in part as follows:

• **OIL USE.**—Viewed on the basis of annual per capita consumption (of petroleum products), the increase is even more startling—4.3 barrels in 1920; 7.6 in 1930; 10.1 in 1940; and 15.2 in 1950. The year 1960 should find us using 18 barrels of petroleum for each citizen of America—for heating, for transportation, for chemicals, and for other purposes . . .

• **RESERVES.**—There is no way of knowing the quantity of these fuels (petroleum and natural gas) ultimately to be recovered from the earth, but the estimated proved reserves of petroleum on December 31, 1949, were 28.4 billion barrels, equal to 14 times recent annual production rates. Similar reserves of natural

A Superior Welding Reducer
with straight tangent on both ends



- Machine tool cut and beveled.
- Formed cold by exclusive Welding Fittings process.
- Annealed, cleaned bright and passivated.
- Smooth interior walls.
- Trade mark, type of material, size, schedule, wall thickness marked.
- Heat number permanently stamped as record of actual analysis and physical properties.

FLOWLINE stainless welding reducers, ells, tees, stub ends, and caps are available in sizes from ½" through 12". 2846 stock items—see Bulletin S-310.

FLOWLINE
STAINLESS WELDING FITTINGS

STAINLESS STEEL TYPES 304, 316, 347
• MONEL • INCONEL • NICKEL

WRITE FOR BULLETIN S-310

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World's Largest Manufacturer of Stainless Welding Fittings

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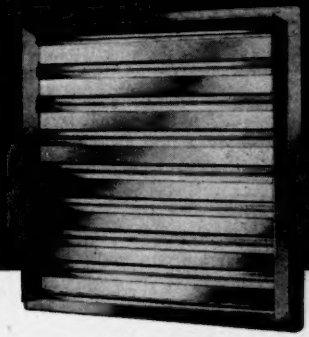

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gas amounted to 180.4 trillion cubic feet, or 29 times current yearly rates of depletion.

It is possible that the consumption of petroleum will exceed domestic discoveries during the next decade, particularly if defense needs should increase the drain greatly. Should this situation develop, there will be a period of several years in which the discrepancy between current consumption and new discoveries will be met by withdrawal from reserves, increased importations from abroad, synthesis from oil shale, or a combination of these sources . . .

• **COAL.**— Essentially all of the growth in the total energy requirements of our economy in the past 30 years has been absorbed by petroleum and natural gas. The coal industry has expanded only in time of war or in the immediate postwar period. In spite of this trend and the current highly competitive state of fuels, the increasing energy markets of the future will probably require large supplies of coal. There are at least three recognizable channels into which coal will be directed: The continued expansion of electric power facilities, probably at the mine; synthetic oil production; and underground gasification of coal for the generation of electric power at the mine.

ASHVE SEMI-ANNUAL MEETING

to take place in Portland, Ore., July 2 to 4.

Special events, which it is hoped will capture some of the flavor of the Great Northwest for members and guests who attend the Semi-Annual Meeting of the American Society of Heating and Ventilating Engineers in Portland, Ore., July 2-4, have been announced by Bert W. Farnes, general chairman of the committee on arrangements. While the meeting is still some time off, members of the Oregon Chapter, which will act as host, are already anticipating a fine attendance. The Hotel Multnomah will be meeting headquarters.

• **TECHNICAL.**—Three technical sessions during which 9 papers will be presented have been announced by the Program and Papers Committee. The subjects of the technical papers will be announced shortly by E. R. Queer, professor of engineering research, Pennsylvania State College, Engineering Experimental Station, State College, Pa. The opening technical session will be called to order on Monday, July 2, by ASHVE president, Lauren E. Seeley. Technical sessions will follow on Tuesday and Wednesday mornings.

The advance group will get under way Sunday, July 1, with council and committee meetings. Those without committee work will be taken on a sightseeing tour by local chapter members.

• **SOCIAL.**—The Research Golf Tournament is planned for Monday afternoon, and for non-players there will be a trip along the Columbia River and a visit to Multnomah Falls. A Hawaiian buffet dinner party with special entertainment and dancing will take place in the evening.

25 TYPES . . . OVER 150 SIZES!

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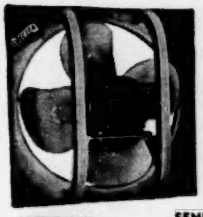
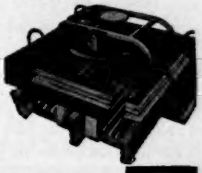


All-Purpose Fan Type BB—
For removing smoke, steam, heat, fumes, etc. Heavy duty, direct drive fan for continuous operation. One piece panel and orifice, lightweight, simple to install. Sizes from 10" to 30".

Industrial Fan Type IND— For large general area ventilation. Moves large volumes of air under pressure. Sizes from 24" to 60".

Chelsea Comfort Cooler Type EV—Designed for attics of low headroom, this Chelsea package unit is complete. Quiet operation, economical to install. Sizes 24" to 48".



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For the BEST in
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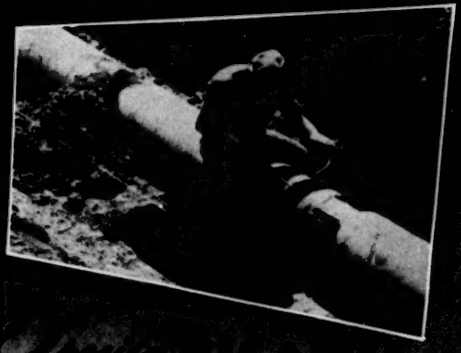

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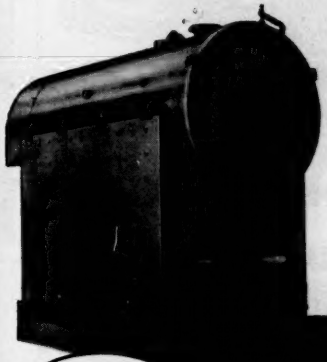
EASY BOILER REPLACEMENT
in tough entry conditions

TITUSVILLE *"Compact"* SPLIT FIREBOX Boilers



Left: Assembled view of Titusville "Compact" Split Firebox Boiler.

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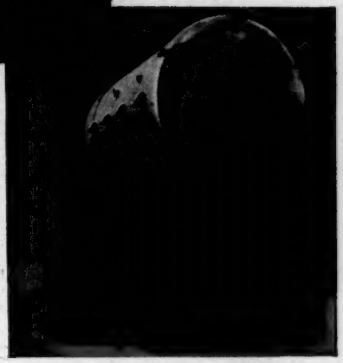

Right: The Titusville "Compact" Split Firebox Boiler with sections opened, suggesting ease of manipulation.

For replacement installations where entrance conditions are not sufficient for the standard boiler, Titusville "Compact" Steel Boilers are obtainable in split firebox design. This practical expedient permits passage of the boiler in unit sections through narrow openings, with easy reassembly. Send us your replacement problem, and let us recommend the best solution for you! Request Bulletin Form C-7959 for Clearance Dimensions.

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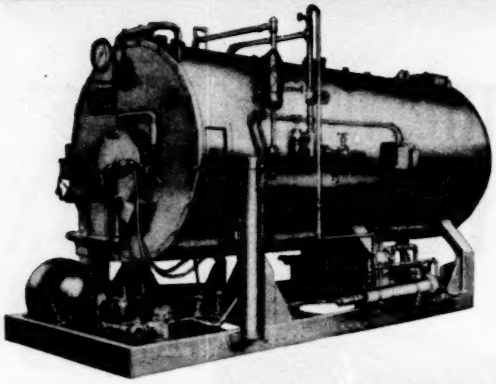

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10 to 500 h. p.—
15 to 200 lbs. capacities

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While the Tuesday morning technical session is being held, the ladies will enjoy a visit to the International Rose Gardens. A visit to the Grotto and Timberline Lodge in the afternoon will be followed by a salmon bake.

• **LARGEST HEAT PUMP.**—An inspection tour of the country's largest heat pump installation and a Mollala Buckaroo will follow the technical session on Wednesday morning. The Buckaroo Parade will start at 10:30 a.m., and the main events will be held in the afternoon. The semi-annual banquet will conclude the meeting.

INCREASED WATER USAGE

makes selection of water cooling equipment for re-use of water vital for conservation.

With water usage in this country double what it was a decade ago, selection of economical water cooling equipment necessary for the industrial re-use of water, has become of vital importance as power demands increase and industries expand their water needs, The American Society of Mechanical Engineers heard at its spring meeting in the Atlanta Biltmore Hotel.

Recent headlines of "water crises" in New York City and elsewhere have brought to public attention basic water shortages that engineers have predicted for years, Howard E. Degler, technical director of the Marley Company, Inc., Kansas City, Kan., told the ASME. In general, he said, water shortage has nothing to do with drought but can be attributed to over-population in cities and increased industrial and agricultural requirements.

This country's requirements are 100 billion gallons per day for everything from drinking and irrigation to making steel and watering the lawn; that is 700 gallons per day per person, he declared.

"The unsuspecting housewife and the indifferent businessman have teamed up with the many industrial users to make water the nation's most precious natural resource," Mr. Degler said. "Like the automobile and the radio, ample water is part of the American way of life." He said most people are surprised to learn that water is exhaustible.

• **HEAVY REQUIREMENTS.**—Mr. Degler said industrial requirements are frequently in excess of 300 pounds of water per pound of finished product. Constantly increasing power demands, expanding industries and the introduction of new processes are making heavy new demands on the hard-pressed water resources of the nation. He named as large industrial users, power plants, manufacturers of paper, petroleum products, rayon, linen, textiles, lactose, sugar, explosives, hydrogen, rubber, steel.

Hydrogen and synthetic rubber each require 2,500 pounds of water per pound of finished product, he revealed. Wool requires 500 pounds of water per pound of finished product, lactose 800, butadiene 1,200, rayon 800, gun powder 400 and steel 250.

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- INSULATES DUCTS
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3. TYPE "TM" HIGH PRESSURE TURBINE PUMP is designed for pressures up to 150 pounds, and boilers to 250 H. P. See Bulletin No. 17.

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SKIDMORE PUMPS

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• **ONCE-THROUGH WASTEFUL.**—Once-through use of cooling water in industry is wasteful, Mr. Degler declared, adding that in many applications the same water can be used for additional service or continuous re-use. He outlined the principles of evaporative cooling and described the operation of mechanical draft cooling towers and air-cooled finned tube exchangers. The towers, he said, require less than one percent evaporation of the water circulated to economically cool the water. The air-cooled exchangers are being increasingly used where high-level heat removal is required where water is scarce, expensive or badly polluted.

"The irrigation of one acre of oranges requires 800,000 gallons of water per wetting," he said. "Producing one kilowatt of electric power or one ton of ice takes 5,000 gallons per day. The midsummer cooling of a large theater requires 80,000 gallons per day. One large paper mill uses 25 million gallons per day, more than the total water pumped for the domestic and industrial use of a city of 200,000 population."

GAS APPLIANCE STANDARDS

adopted by AGA approval requirements committee.

Important new gas appliance approval requirements and significant revisions of existing standards and test methods were adopted by the American Gas Association Approval Requirements Committee at its recent meeting at the A.G.A. Laboratories in Cleveland. The Approval Requirements Committee is composed of representatives of utilities, manufacturers, public bodies and trade associations.

• **TEST METHODS.**—The committee reviewed and adopted the recommendations of a number of its subcommittees aimed at modifying individual requirement tests to meet new trends and industry needs as disclosed by research, technical investigations and field experience throughout the country. The new standards will go to the American Standards Association for final adoption and upon acceptance, they will become effective in 1952.

Major revisions adopted will affect the testing of central heating equipment, unit heaters, water heaters and automatic pilots. Of special importance was the adoption of new test methods covering electrical components on appliances and expansion of existing provisions for such features.

• **CENTRAL HEATING.**—Central heating revisions cover the many changes in design that have accompanied the trend to compact, automatically controlled equipment, in many instances requiring advanced electrical and mechanical components. Revisions also apply to units designed for confined space installation and recessed heaters.

Electric requirements for central heating appliances, unit heaters and ranges have been coordinated with

those of other testing organizations. In order that greater acceptance of appliances by electrical code authorities may be obtained, the A.G.A. Laboratories have installed new electrical testing facilities and will formulate test methods covering all types of appliances.

• **PILOTS.**—Listing requirements for automatic pilots were completely rewritten to provide for their testing under conditions more nearly approaching those encountered in the field.

Revisions to water heater requirements included standards for a new high temperature classification for automatic storage type heaters covering units intended to deliver outlet water at a temperature in excess of 160 degrees. Modern demands for commercial units for sterilizing dishes and tableware, as well as domestic hot water needs for automatic dishwashing and clothes washing, in many instances call for water up to 180 degrees in temperature. Such units now must meet all requirements for ordinary automatic storage type heaters and also meet additional tests established for such special classification. Testing of such units is optional and will only be conducted on request.

Thermostatic control of gas range ovens was made a mandatory requirement to be effective immediately.

WOOD FLOOR PANELS

installed in old homes prove satisfactory.

Radiant floor panel heating can be successfully installed under wooden floors in existing buildings of normal frame construction, it is reported by the Plumbing and Heating Industries Bureau.

To the many owners who would like to have existing houses equipped with panel heating, it is good news to know that the problems involved are simple and easily overcome. Such installations have been found to have all the advantages associated with panel heating systems with coils embedded in either concrete or plaster.

Typical bungalow installations are described by the Bureau. The bungalows in which these installations were made had crawl spaces and no basements.

• **INSTALLATION.**—The pipe coils were hung under the floor joists in the crawl spaces by means of pipe hangers. Furring strips were nailed to the joists and insulation was attached to seal the heat in the joist system and reduce the downward heat loss. In restricted crawl spaces, aluminum foil insulation was found to be easiest to install. In others, insulation board was used.

The heating systems were forced circulation hot water, automatically fired. Controls used were of various types, including the modulating type with outdoor bulb. It was found that a conventional thermostat controlling the pump which circulates the hot water gave excellent results. A recorder in this home showed that temperature variations did not exceed one degree.

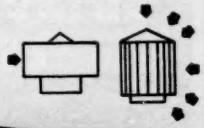
do you know

the TRUTH about ventilators?

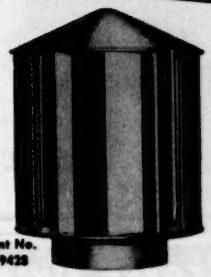
Ventilators are usually selected on the basis of their *capacity ratings*. That makes sense, but do you know that:

1. Capacity ratings of most ventilators are *not* certified.

2. Capacity ratings of most ventilators are based on *horizontal* wind tests only.



Breidert Air-X-Hausters
provide safe, sure ventilation no matter which way the wind blows!

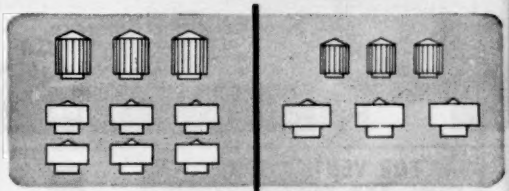


Patent No. 2269428

and . . . Breidert Air-X-Hausters are the *only* ventilators with published certified capacity ratings based on tests* made with wind blowing in *all* directions as shown above.

Only such tests can guarantee the capacities a ventilator will deliver under actual operating conditions. No matter which way the wind blows, barring interior negative pressures, the Breidert provides safe, sure ventilation . . . on roofs, vent flues, chimney tops. Stationary, no moving parts, nothing to jam or get out of order.

HOW YOU CAN GET BETTER RESULTS WITH LESS MONEY



It takes fewer Breiderts to do the job as same size conventional ventilators. **(or)** *You can use the same number of smaller size Breiderts to do the same job as conventional ventilators.*

Get *all* the facts! Write today for complete Engineering Data Book, including certified capacity ratings. Address Dep't B.

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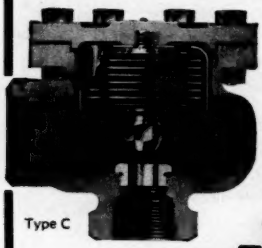

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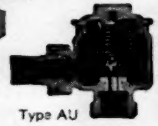

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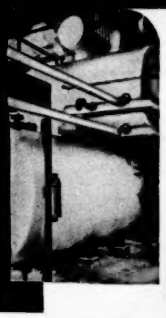

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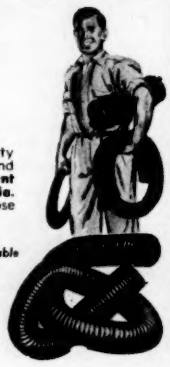

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ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

REFRIGERATION DATA BOOK

The Refrigeration Data Book, Applications Volume, first published in 1940 and revised in 1946, has undergone a second revision. All chapters of the previous edition have been reviewed, revised and brought up to date and a number of chapters have been rewritten to conform with current practice. In addition to a new chapter on Metals for Use at Low Temperature, there are four chapters pertaining to foods.

This edition was prepared with Dan C. McCoy as editor-in-chief, with eight sections compiled under the direction of an equal number of associate editors. The book contains 81 chapters each written by an expert in that field. The chapters are grouped into the following sections: Frozen foods, cold storage practice, refrigeration in food manufacture, refrigerated food distribution, low temperature application, industrial applications, comfort air conditioning and industrial air conditioning. In addition, there is a classified section of manufacturers arranged according to the product, so that information is available for those seeking lists of suppliers and manufacturers of equipment.

Refrigeration Data Book, Applications Volume, third edition, edited by D. C. McCoy. Cloth bound, 6 x 9 inches, 1,080 pages. Published by the American Society of Refrigerating Engineers, 40 W. 40th St., New York 18, N. Y. Price, $6.

SUN ANGLE CALCULATOR

To eliminate the calculations necessary to determine the sun's position, the angle of incidence, and to better apply the sun's angular values to the design of buildings, an instrument termed the Sun Angle Calculator was developed by the physicists and mathematicians of Libbey-Owens-Ford Co. as part of that company's research and development program. Preparation and production supervision was by Aeronautical Services, Inc., a group experienced in the field of navigation instruments.

The map of the United States is divided into latitude lines starting from 24° and spaced four degrees apart. There is a sun chart for each four degrees of latitude from 24° to 52°. Charts are printed on both sides of white plastic squares 8¼ inches on a side. As part of the device is a transparent circle of plastic 8 inches in diameter and a transparent pointer or cursor. In operation, the circular disc, on which are printed lines showing angle of incidence and profile angles, is placed over the base sun chart of the proper latitude range. A brass pin fastens the disc and pointer to the chart through the center.

By rotating the disc in accordance with instructions given in an accompanying book, it is possible, knowing the geographical location, to determine the profile angle so that the position and certain dimensions of all types of shading devices can be established; the azimuth of the sun for a specific location; the angle of incidence

of the sun with respect to a window or wall; the true altitude of the sun for a specific date and hour. With these charts, it is possible to determine the width and length of overhang or sun shade for a window.

Sun Angle Calculator. Set includes instruction book and 8 charts to cover latitudes from 24° to 52°. Libbey-Owens-Ford Glass Co., Toledo, Ohio. Price, $9.50.

• • •

REFRIGERTION STANDARDS—The American Standards Association prepared the Standard B59.1-1950 on Standard Recommended Practice for Mechanical Refrigeration Installations on Shipboard, and Standard B60.1-1950 on American Standard Method of Rating and Testing Refrigerant Expansion Valves. The first covers systems such as those for carrying refrigerated cargo and cooling and dehumidification of air for circulation to or within ship compartments. The other covers methods of rating and testing thermostatic and constant pressure expansion valves for use in refrigerant systems. Price of first Standard, $1; Standard B60.1-1950, 50 cents. American Standards Association, 70 East 45th St., New York 17, N. Y.

School Heating Regulations

(Continued from page 107)

locker rooms and gymnasiums, and other rooms from which noise, odors or dust might be vented into corridors. Each flue shall insure a positive upward air current. Toilet rooms shall have vent openings in flues covered by grilles, both at the floor and at the ceiling. Where the toilet room is heated by warm air, then only a vent flue opening at the floor is required. Vent flues should have the same dimensions throughout their entire length and they shall be carried through the attic and above the roof as separate flues or in combination of flues. Corridor venting shall have suitable vent openings in the ceiling of the top floor, with a flue extending from the ceiling to the ventilator on the roof. Grilles are necessary for all ceiling openings; flues are to have dampers.

Registers and grilles should have an open area equivalent to the capacity of the flue. In schoolrooms, there shall be an opening in the heat flue for a grille, register or diffuser, having the lower edge about 8 ft above the floor. A heat flue with an opening 8 ft above the floor may also have an extra opening near the floor and this lower opening is to have a grille, and the heat flue provided with a damper to deflect air through the grille. If suitable dampers are provided, then no registers or grilles are required for vent openings.

Floor registers are considered as unsanitary and cannot be installed even as foot warmers or as outlets for foul air. However, baseboard registers may be used when they will not in any way interfere with the sanitary condition of rooms.

All of these current requirements are not rigidly enforced. The Division of Buildings and Business Administration of the State Department of Education, which examines all plans and specifications for public school building projects, is willing to accept deviations from code requirements where technical advances or special local situations appear to justify such changes.

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Baltimore, Md.	475	237
Buffalo, N. Y.	765	490
Chicago, Ill.	727	456
Cleveland, Ohio	696	429
Detroit, Mich.	758	484
Indianapolis, Ind.	675	412
New York, N. Y.	510	252
Philadelphia, Pa.	484	237
Pittsburgh, Pa.	550	302
St. Louis, Mo.	(a)	(a)

(a) Data not available.

Canadian Degree-Days for February, 1951*

City	February		Cumulative Sept. 1 to Feb. 28	
	1951	Normal	1950-51	Normal
Calgary, Alta.	1456	1355	7244	6666
Charlottetown, P.E.I.	1120	1338	5073	5666
Crescent Valley, B. C.	1098	1112	5449	5743
Edmonton, Alta.	1588	1501	7869	7299
Fort William, Ont.	1562	1582	7527	7204
Grande Prairie, Alta.	1705	1456	8644	7456
Halifax, N. S.	962	1170	4281	5068
London, Ont.	1142	1240	5277	5253
Medicine Hat, Alta.	1518	1406	6888	6438
Moncton, N. B.	1168	1392	5351	6106
Montreal, P. Q.	1327	1460	5764	6108
North Bay, Ont.	1411	1492	6763	6653
Ottawa, Ont.	1352	1459	6071	6382
Penticton, B. C.	963	969	4605	4779
Porquis Junction, Ont.	1607	1764	7917	8064
Prince George, B. C.	1473	1305	7474	6677
Quebec City, P. Q.	1322	1481	5969	6688
Regina, Sask.	1758	1764	8369	8137
St. John, N. B.	1081	1266	4976	5652
Saskatoon, Sask.	1817	1635	8620	7911
Toronto, Ont.	1046	1206	4647	5154
Vancouver, B. C.	754	736	3735	3797
Victoria, B. C.	694	689	3539	3414
Windsor, Ont.	1084	1148	4838	4877
Winnipeg, Man.	1609	1775	7971	8091

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

Getting Personal

L. J. DuBois

Louis J. DuBois *(Air Conditioning Theaters,* page 81) was born in Racine, Wis., and later resided in Eldorado, Ill., where he completed his high school education. In 1923 he received his B.S. in M.E. from the University of Illinois. Following graduation, he joined the York Student Course and upon completion became a member of the newly formed Air Conditioning Department of the Sales Division at the factory. In 1931 he transferred to the St. Louis office specializing in air conditioning in that territory. During the war years he returned to York, Pa., for special assignments in the Sales Division. In 1946 he returned to active selling with Westerlin & Campbell Co., Chicago, a subsidiary of York Corp.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

HYGIENE CONFERENCE — Joint conference of four groups, including American Industrial Hygiene Association, at Chalfonte-Haddon Hall, Atlantic City, N. J. Dr. Henry Smythe, Jr., Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 13, Pa. ..... **APRIL 22-27, 1951.**

FOUNDRYMEN'S CONVENTION—55th annual convention of the American Foundrymen's Society, in Buffalo, New York. William W. Maloney, secretary-treasurer of the Society, 616 S. Michigan Ave., Chicago 5, Ill. ..... **APRIL 23-26, 1951.**

REFRIGERATION MEETING—Annual meeting of the Refrigeration Equipment Manufacturers Association, at The Homestead, Hot Springs, Va. George E. Mills, public relations director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. ..... **APRIL 30—MAY 2, 1951.**

ANTHRACITE CONFERENCE—9th annual Anthracite Conference at Lehigh University, Bethlehem, Pa. Prof. A. C. Callen, conference chairman, Lehigh University..... **MAY 4-9, 1951.**

ARCHITECTS CONVENTION—1951 convention and national seminar meetings of The American Institute of Architects, at the Edgewater Beach Hotel, Chicago, Ill. Paul Gerhardt, Jr., chairman, 121 No. LaSalle St., Chicago, Ill. **MAY 8-11, 1951.**

CONTRACTORS MEETING—62nd annual convention of the Heating, Piping and Air Conditioning Contractors National Association, at the Shoreham Hotel, Washington, D. C. Jos. C. Fitts, secretary of Association, 1250 Avenue of the Americas, New York 20, N. Y. ..... **MAY 8-11, 1951.**

ASRE MEETING—Spring meeting of the American Society of Refrigerating Engineers, at Hotel Statler, Detroit, Mich. M. C. Turpin, secretary, 40 West 40th St., New York 18, N. Y. ..... **MAY 27-30, 1951.**

NDHA MEETING—42nd annual meeting of the National District Heating Association, at the Statler Hotel, Detroit, Mich. John F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 3-8, 1951.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Royal York, Toronto, Ont., Canada. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. ..... **JUNE 18-22, 1951.**

STOKER MEETING — 1951 annual meeting of the Stoker Manufacturers Association, at South Shore Inn, Lake Wawasee, Syracuse, Ind. Marc G. Bluth, executive secretary of the Association, 307 North Michigan Avenue, Chicago 1, Illinois. ..... **JUNE 25-26, 1951.**

ELECTRICAL ENGINEERS MEETING—Summer general meeting of the American Institute of Electrical Engineers, at Royal York Hotel, Toronto, Ont., Canada. Secretary of the Institute, 33 West 39th St., New York 18, N. Y. ..... **JUNE 25-29, 1951.**

ASHVE MEETING—Semi-annual meeting of the American Society of Heating and Ventilating Engineers, at the Hotel Multnomah, Portland, Ore. A. V. Hutchinson, executive secretary of the Society, 51 Madison Ave., New York 10, N. Y. ..... **JULY 2-4, 1951.**

REFRIGERATION CONGRESS—Eighth International Congress of Refrigeration, under the auspices of The International Institute of Refrigeration, to be held at Church House, Westminster, London, England. The Secretary, Dalmeny House, Monument St., London, E. C. 3. ..... **AUGUST 29—SEPTEMBER 11, 1951.**

INSTRUMENT CONFERENCE AND EXHIBIT—1951 Instrument conference and national exhibit of the Instrument Society of America, at the Coliseum, Houston, Tex. John McCaffery, assistant executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 10-14, 1951.**

PLUMBING AND HEATING MEETING—Annual meeting of the Plumbing and Heating Industries Bureau, at Palmer House, Chicago, Ill. Norman J. Radder, secretary of the Bureau, 35 East Wacker Drive, Chicago 1, Ill. ..... **OCTOBER 11, 1951.**

AGA CONVENTION—33rd annual convention of the American Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Avenue, New York 17, N. Y. ..... **OCTOBER 15-17, 1951.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. ..... **NOVEMBER 5-8, 1951.**

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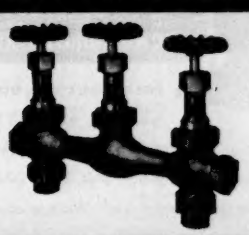

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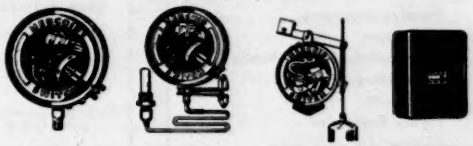

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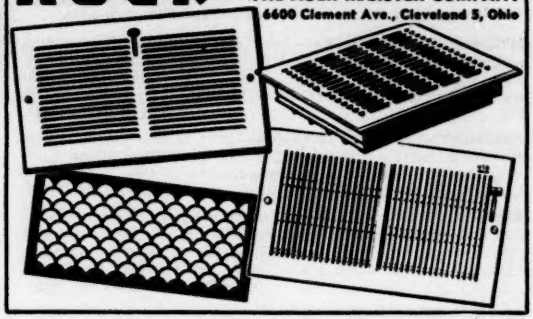

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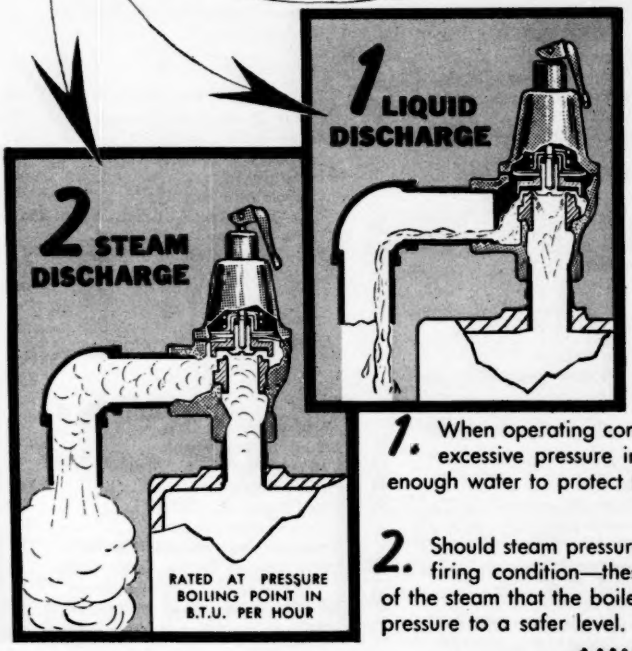

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AIR CONDITIONING DESIGN CONDITIONS — INDUSTRIAL PLANTS

(Concluded)

Textiles — Cotton, Wool, Silk Processing

Table 16 lists conditions to be maintained in the processing of cotton, linen, woolens and silk.

TABLE 16—AIR CONDITIONS FOR TEXTILE MANUFACTURE
Presented by Source A

Room or Process	Temperature, °F	Relative Humidity, %
Cotton		
Opening	75	55
Picking	75	55
Carding	75	55
Drawing	80	60
Roving	85	60
Ring Spinning		
Conventional	80 - 85	60 - 70[a]
Long draft	80 - 85	55[b]
Spooling and warping	80	65
Weaving	85	70 - 85[c]
Cloth room	75	60 - 70
Linen		
Carding	75 - 80	60
Spinning	75 - 80	60
Weaving	80	85
Woolen Processing		
Picker	80 - 85	60
Carding	80 - 85	65 - 70
Spinning	80 - 85	55 - 60[d]
Dressing	75 - 80	60
Weaving	85 - 85	60 - 75[e]
Worsteds		
Carding	80 - 85	55
Combing	80 - 85	65 - 70
Gilling	80 - 85	65 - 70
Top storage	70 - 85[f]	75 - 80
Drawing	80 - 85	65
Cap spinning	80 - 85	50 - 55
Spooling and winding	75 - 80	65 - 70
Weaving	80	55 - 70[g]
Finishing	75 - 80	60
Silk		
Preparatory	80	60 - 65
Weaving	85	60 - 70

[a] Relative humidity maintained in ring spinning depends upon the count, twist, and whether the spinning is long draft with leather aprons for conveying the stock. The spoon results indicate an idea that the cotton sticks to the spoons when 55% is the limit of the relative humidity. If conventional, 3- or 4-roll spinning is run, relative humidities can be as high as 70%, but that depends upon the fiber, twist and staple.

[b] Relative humidity control in cotton weaving depends on the cloth construction.

[c] Relative humidities to be maintained for the mules is generally 55%; conditions over frame spinning, 70-85%. Both types of spinning depend upon the class of stock spun, also the counts in the yarns.

[d] Woolen worsted spinning calls for 60% R.H. However, on heavy goods such as 32 on overcoating, highest production is experienced with 75% R.H.

[e] This depends upon whether either long pulled conditioning or low temperature or cold conditioning at high temperature is used.

[f] This depends upon staple quality and construction.

Natural fibers lose dust and twist by incorporating moisture which accounts for the lower relative humidities maintained in spinning than in drawing.

One objective of processing textiles is to get the proper weight of material per given length. All machinery is constructed and delivers a definite number of cloth per given length of time. Weight is determined by the moisture content of the air surrounding the processed cloth—namely, humidity or dampness of the cloth.

Therefore, regardless of whether the textile fibers are synthetic, animal or vegetable, controlled humidification is of great importance in the processing of each textile.

All textile machinery generates static electricity. This is materially allayed by use of 50-60% R.H.

High relative humidities in the various processes also serves considerably to lay dust. This is attributed to by the fact that in blue denim weave sheds, where weaving is done under low relative humidities, often one spends an hour's time in such a shed, then in a definite blue ring around the nostrils and then due to dust. Such a condition is not experienced in [illegible]

TABLE 17—AIR CONDITIONS FOR TEXTILE MANUFACTURE
Presented by Source B

Room or Process	Temperature, °F	Relative Humidity, %
Cotton		
Opening and picking	75	55 - 60
Carding	75	55 - 60
Combing	75	60 - 65
Drawing	75	60 - 65
Roving	75	60 - 65
Spinning	75 - 80	55 - 65
Spooling	—	70
Weaving	75 - 78	70 - 85
Warp tying	—	65 - 70
Cloth room	—	65 - 70
Laboratory	75	60
Woolen		
Scribbling		
Carding	75	60 - 70
Combing	—	60 - 65
Drawing	75	60 - 65
Spinning	75	55 - 60
Weaving	75	55 - 60
French		
Carding	75	60
Combing	75	55
Drawing	75	60 - 65
Spinning	80 - 85	75 - 80
Weaving	75	55 - 60

[a] If it is maintained and cleaned, then relative humidity should be 50%.

[b] It is essential to have full, clean and early cooling continuously on cloudy days, to keep the relative humidity down. 60% under dry conditions, the cord is hard to start.

[c] Relative humidity may go as high as 90% when many synthetic additives are to be worked and warps are heavily sized. In winter temperatures should be 75-78°F. In summer, 85°F at 90% R.H.; 80° at 80% R.H.; 87°F at 70% R.H.

[d] Both temperature and relative humidity are held to ± 5.

sheds when high relative humidities are maintained.

Data in Table 18 were obtained from another textile authority. In some items, they vary with the information given in Table 17, but a study of the two tables helps one to arrive at suitable average conditions.

Textiles – Manufacture of Rayon

Although it is possible to produce rayon from many substances, wood pulp and cotton are used almost exclusively because they have the purest cellulose in the most readily available state. Raw material in the form of sheets is dipped in a caustic soda solution. At the end of the steeping operation, the sheets are broken up into a fine matted crumb. These operations are carried on in a room maintained at 70F and 55% R. H. The humidity is held down to prevent condensation on cold pipes and jackets.

The crumb is dumped into tanks for aging. Although this room is maintained at 72F, it is not necessary to control the humidity.

In the churn room, the sodium cellulose is converted to cellulose xanthate. Temperatures are maintained at 75-80F, and since the cellulose is not exposed to the air, humidity control is not important. During summer, room temperatures are held below 85F.

After ripening, the viscose solution is pumped to spinning machines. The many filaments that are produced by fine jets are twisted into thread and collected in a revolving circular box. In the spinning operation, it is desirable to limit the temperature to 90F during the summer and to keep the relative humidity at least 70% or higher. Variations in temperature and humidity may cause crystallization of the solution which in turn results in breakage of the thread. Winter conditions are 75F and 70% R. H.

The centrifugal force of the revolving box in spinning produces an annular cake. This cake is removed from the box and is held in storage until needed for later processing. This storage room is kept at 85F and 100% R. H.

From the storage room, the cake goes through the following processes: first washing, desulfurizing, acidification, bleaching and final washing. Cakes are loaded on skid-type racks and moved into the drying room. After cakes are dried, they are left in the drier under controlled conditions of 100F and 65% R. H., to bring the rayon back to the proper regain.

The final operation takes place in the coning room where winding machines place the rayon yarn on cones. As rayon yarn is sold by weight, definite humidity control is needed. Temperature is kept at a maximum of 80F to prevent perspiration from workers' hands from soiling the yarn, and relative humidity is kept at 55% so that the yarn will have the legal moisture.

Textiles – Processing Synthetic Fibers

A number of twisting and winding operations, called throwing, up-spinning, twisting, winding, coning, warping, capping and quilling, are required to prepare rayon filament yarn for weaving or knitting. Air conditioning serves to condition the yarn so that it is workable at high speed with a minimum of breakages and irregularities. See Tables 18 and 19.

Temperature, too, is important. It should be high enough to prevent hardness in the rayon and combined with adequate humidity to minimize static. During cool weather, temperature should be high enough to lessen the variations between cool and hot weather operation. Temperature is important in the weave room. Many of the troubles formerly attributed to variations in humidity are now known to be caused also by variations in temperature. A minimum temperature of 80F helps to prevent hardness in the yarn. Uniform pliability and tension are also favored by a fixed, uniform temperature. A moderate amount of humidity is looked upon as insurance against static.

The A.S.T.M. has standardized testing and laboratory conditions at 70F and 65% R.H. based on four hours' exposure.

TABLE 18—AIR CONDITIONS FOR RAYON AND SYNTHETIC FIBER PROCESSING
Prescribed by Source A

Room or Process	Temperature, F	Relative Humidity, %
Viscose		
Preparatory	80	60
Weaving	80	60
Celanese		
Preparatory	80	70
Weaving	80	70 - 75
Nylon		
Preparatory	80	50 - 60
Weaving	80	50 - 60

TABLE 19—AIR CONDITIONS FOR RAYON PROCESSING
Prescribed by Source B

Room or Process	Temperature, F	Relative Humidity, %
Throwing	80[1]	55 - 65
Picking	—	50 - 60
Carding, drawing, roving	80 - 90	50 - 60
Spinning	80 - 90	50 - 60
Weaving		
Regenerated rayons	80	50 - 65
Acetate	80	55 - 60[2]
Spun rayons	80	80[3]
Knitting		
Viscose or cuprammonium type	80 - 85	65
Acetate	80 - 85	70

[1]There is a growing tendency to increase the humidity and some manufacturers have tried 65% R.H. with satisfactory results. In the South, a minimum temperature of 85F is preferred.
[2]The minimum range of relative humidity is 55-60% and the maximum, 70-75%.
[3]Maximum condition.

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